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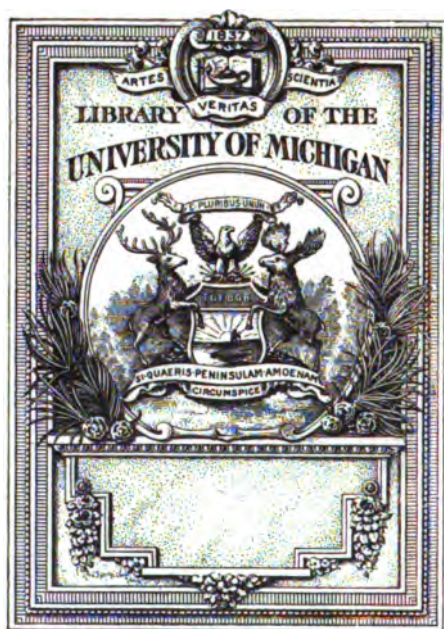
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SIXTH ANNUAL REPORT
OF THE
JOHNS HOPKINS UNIVERSITY

Baltimore Maryland

1881

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SIXTH ANNUAL REPORT
OF THE
Johns Hopkins University
Baltimore Maryland

1881

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*Hon. George W. Dobbin was elected President of the Board of Trustees, April 4, 1881, in place of Galloway Cheston, deceased. Mr. Lewis N. Hopkins was elected Secretary, February 6, 1882, in place of William Hopkins, deceased. Mr. J. Hall Pleasants and Dr. Alan P. Smith were elected, November 7, 1881, to fill the vacancies in the Board.

SIXTH ANNUAL REPORT.

To the Trustees of the Johns Hopkins University :

In presenting the Sixth Annual Report of the Johns Hopkins University,—it does not seem important to describe the origin and growth of this foundation, for that has been done in the preceding reports ; and accordingly I shall aim at the present time simply to recapitulate the facts which mark our progress in the year ending September 1, 1881. We have seen no reason to depart from the principles originally laid down, and we have already reached some of the results at which we have been aiming. The university courses continue to draw students from every part of the country and the collegiate courses are obviously acceptable to the youth of Baltimore for whose especial benefit they have been maintained. The authorities of the university attach much importance to the collegiate department, and do not doubt that it will continue to grow in public estimation as its methods and results become more generally understood.

The academic staff included during the year thirty-nine teachers, four of whom were non-resident

lecturers and two non-resident associates. In addition to this staff, five professors, not otherwise connected with the university, acted as examiners in particular subjects where their judgment was sought. The number of students enrolled during the year was one hundred and seventy-six, of whom ninety-five were residents of Maryland and eighty-one came here from twenty-one states of the union and from four foreign countries. Among the students were one hundred and two already graduated, representing forty-six colleges and universities; there were thirty-seven matriculates, (or candidates for the degree of Bachelor of Arts), and there were thirty-seven admitted as special students, to pursue courses of study for which they seemed fitted, without reference to possible graduation. The daily attendance upon eighty-two public lectures was one hundred and eighty-six,—ascertained by the count of the door-keeper. Besides the classes of students above mentioned, twelve teachers attended a course in Latin, meeting on Saturdays, and a company of fourteen, an exercise in Biblical exegesis.

The following table indicates the enrollment since the university was opened in the autumn of 1876.

	Graduates, (incl. Fellows.)	Matriculates.	Non- Matriculates.	Total Enrolled.	Average Attendance at Public Lectures.
1876-77	54	12	23	89	60
1877-78	58	24	22	104	84
1878-79	68	25	35	128	96
1879-80	79	32	48	159	113
1880-81	102	37	37	176	186

The attendance upon some of the principal courses during the last three years has been as follows :

	1878-79.	1879-80.	1880-81.
Mathematics,	88	81	81
Physics,	82	88	85
Chemistry,	89	46	40
Biology,	26	82	25
Greek,	40	86	31
Latin,	27	40	40
German,	55	60	55
French, Italian, etc.	18	32	33
English,		19	29
History, etc.		83	40
Logic,	6	16	18
Philosophy and Ethics,	6	12	14

The total number of individuals enrolled as students upon our books prior to September 1, 1881, is three hundred and seventy; of this number there came from Maryland two hundred and twelve, including one hundred and seventy-four from Baltimore; the other students came from thirty-four states and countries. Two hundred and twenty-seven persons have pursued courses as graduate students, and one hundred and forty-three as collegiate students.

Further statistical information may readily be found by consulting the annual Register, and the Official Circulars which appear from time to time; in this place it seems desirable to call attention to the actual instruction which was given during the past academic year. Every instructor has been

free (subject of course to the general plans of the university) to employ whatever agencies seemed most likely to benefit the class which came to him, and hence a great variety of educational forces have been constantly at work among us. Recitations and lectures are, as elsewhere, the ordinary means of instruction; the three laboratories, constantly open, have given to the students of chemistry, physics, and biology opportunity both for elementary training and for observing, or for participating in original investigations; in mathematics, languages, and history, seminars have been conducted for the purpose of showing advanced students the processes by which independent researches are to be carried on; public lectures have been provided to present the more popular and general aspects of various literary and scientific inquiries; several societies, presided over by the instructors, have held their meetings regularly for the reading of communications and for comment upon them; there are three reading clubs whose aim is to make a constant review of the higher current scientific literature; there is a field-club for the out-door observation of nature in the vicinity of Baltimore; during the summer, a marine station is maintained upon the coast of North Carolina for the prosecution of zoölogical work; and the library, with its constant reception of new books,—German, French, English, and American publications, is constantly open from

early morning to the late evening. Besides all this, the teachers are encouraged to do whatever they can for the advancement of the sciences to which they are devoted, and the university has contributed liberally to the publication of results.

The following tables which have been carefully prepared from the records filed in the registrar's office indicate the number of attendants in each department of study, the number in each class, the name of the teacher, and the number of appointments for each course.

COURSES OF INSTRUCTION.

The instruction in Mathematics was under the direction of Professor Sylvester, aided by W. E. Story, Ph. D., F. Franklin, Ph. D., and T. Craig, Ph. D. The entire number of students was thirty-one and their distribution is indicated in the following list:

MATHEMATICAL SEMINARY (22). *Monthly, through the year.*

THEORY OF NUMBERS (8). *Twice weekly, through the year: Professor Sylvester.*

PROBLEMS OF MATHEMATICS (5). *Weekly, through the year: Dr. Story.*

HIGHER PLANE CURVES [Advanced Course] (5). *Twice weekly, through the year: Dr. Story.*

MECHANICS (6). *Twice weekly, through the year: Dr. Story.*

HIGHER PLANE CURVES [Elementary Course] (3). *Three times weekly, second half-year: Dr. Story.*

SOLID ANALYTIC GEOMETRY (5). *Four times weekly, second half-year: Dr. Story.*

CONIC SECTIONS (10). *Three times weekly, through the year: Dr. Story.*

THEORY OF FUNCTIONS (8). *Three times weekly, first half-year: Dr. Craig.*

PARTIAL DIFFERENTIAL EQUATIONS (5). *Twice weekly, second half-year: Dr. Craig.*

DETERMINANTS (9). *Twice weekly, first half-year: Dr. Franklin.*

MODERN ALGEBRA (6). *Twice weekly, second half-year: Dr. Franklin.*

DIFFERENTIAL CALCULUS (6). *Three times weekly, first half-year: Dr. Franklin.*

INTEGRAL CALCULUS (5). *Three times weekly, second half-year: Dr. Franklin.*

THEORY OF EQUATIONS (5). *Twice weekly, through the year: Dr. Franklin.*

ORDINARY DIFFERENTIAL EQUATIONS (4). *Three times weekly, second half-year: Dr. Franklin.*

The results of special studies have been examined and discussed in the SEMINARY, during the year, under the direction of Professor Sylvester, as follows:—

By J. J. Sylvester, on the resultant of two congruences; on the multiplication of the roots of unity; on the prerogative of a ternary denominational system of coinage;—by W. E. Story, on a notation for totients; on two kinds of k -th totients; outline of Clebsch's and Gordan's method of finding the groundforms of a binary quartic;—by T. Craig, a proof of Abel's theorem;—by C. S. Peirce, proof that there are only three linear associative algebras in which division is an unambiguous process;—by F. Franklin, a deduction from the properties of a system of three circles; on v. Gall's table of groundforms for the octavic; a new proof of Euler's development of the infinite product $(1-x)(1-x^2)(1-x^3)\dots$; on Newton's method of approximation;—by A. S. Hathaway, upon the similarity between congruences and equations, and its significance; the cyclotomic functions, with respect to a prime modulus p ; on modular functions;—by O. H. Mitchell, on the properties of the roots of $x^2 \equiv x \pmod{k}$; a theorem including Fermat's and Wilson's theorems; on binomial congruences, $(\text{mod. } p, f(x))$;—by H. M. Perry, on a rule of signs in determinants;—by R. W. Prentiss, a problem in maxima and minima; a geometric locus;—by C. A. Van Velzer, on certain compound determinants. Abstracts of these papers have been printed in the *University Circulars*.

In Physics, under the direction of Professor Rowland, there were thirty-five students. The courses in General Physics were given by C. S. Hastings, Ph. D., lectures on Hydrodynamics were given by Thos. Craig, Ph. D., and the chief assistant in the

laboratory was E. H. Hall, Ph. D. The attendance was as follows :

LABORATORY WORK FOR ADVANCED SPECIAL STUDENTS (5). *Daily, through the year : Professor Rowland.*

ELECTRICITY AND MAGNETISM (5). *Four times weekly, through the year : Professor Rowland.*

HYDRODYNAMICS (5). *Four times weekly, through the year : Dr. Craig.*

MAJOR COURSE (10). *Lectures, weekly through the year, and daily work in the Laboratory, especially on Wednesdays : Dr. Hastings.*

GENERAL PHYSICS [Elementary Mechanics, Acoustics, Heat, Magnetism, Electricity, and Light] (16). *Daily, through the year, with a weekly exercise in the Laboratory : Dr. Hastings and Dr. E. H. Hall.*

READING AND DISCUSSION OF CURRENT PHYSICAL JOURNALS (6). *Weekly, through the year.*

PUBLIC LECTURES :

The Sun and Radiant Energy (207). *Six lectures : Prof. S. P. Langley.*

The Conservation of Energy (188). *Four lectures : Professor Rowland.*

Light (208). *Four lectures : Dr. Hastings.*

The Photophone and Spectrophone (235). *One lecture : Dr. A. Graham Bell.*

The researches carried on in the LABORATORY (which has been open for eight hours daily) by the Fellows and advanced students, under the direction of Professor Rowland, included the following subjects:—

The new action of magnetism on electric currents discovered by Dr. E. H. Hall; a determination of the mechanical equivalent of heat by electrical means; the study of the supposed generation of electricity by evaporation, etc.; on the diamagnetic constants of bismuth in absolute measure, etc.

The courses in Chemistry were attended by forty students and were conducted by Professor Remsen, and H. N. Morse, Ph. D., as follows :

GENERAL CHEMISTRY [NON-METALS] (22). *Four lectures by Professor Remsen and two examinations by Dr. Morse, weekly, first half-year.*

GENERAL CHEMISTRY [METALS] (14). *Four lectures and two examinations weekly, second half-year : Dr. Morse.*

CHEMISTRY OF CARBON COMPOUNDS (12). *Four times weekly, second half-year : Professor Remsen.*

ANALYTICAL CHEMISTRY (7). *Three times weekly, first half-year : Dr. Morse.*

LABORATORY WORK (39). *Daily, through the year : Professor Remsen and Dr. Morse.*

READING AND DISCUSSION OF CURRENT CHEMICAL JOURNALS. *Twice weekly, through the year.*

PUBLIC LECTURES:

Selected Topics in Chemistry (229). *Four lectures : Professor Remsen.*

The Fellows and advanced students have been engaged in the LABORATORY (which has been open for eight hours daily) in carrying on, under the direction of Professor Remsen, the following investigations, most of which either have been or soon will be published:—

On the conduct of finely divided iron toward nitrogen; on chemical action in a magnetic field; on the structure of mesitylenic sulphinide; on the oxidation of nitrometaxylene; on the sulphocinnamic acids; on the oxidation of metatoluene-sulphamide; a comparative study of sulphoisophthalic and sulphinido-isophthalic acids; on α -osyisophthalic acid; on phthalimide; transformations of formylorthotoluidine; on the separation of barium from calcium, strontium, and magnesium; on the estimation of chromium in chrome-iron ore; an examination into the methods now in use for the detection of carbon monoxide (carbonic oxide) in the air of rooms heated by hot air furnaces and cast-iron stoves, (for the National Board of Health); a portion of the work of an investigation on the methods for the estimation of organic matter in potable waters, (for the National Board of Health.) The entire water supply of Baltimore having become contaminated during the winter of 1880–81, the Mayor and Water Board requested Professor Remsen to make a thorough examination of the water and to report to them. This work was carried on in the laboratory, and an elaborate report was published.

The work in Biology was under the direction of Professor Martin. W. K. Brooks, Ph. D., lectured on Osteology, and instruction was also given by H. Sewall, Ph. D., and W. T. Sedgwick, Ph. D. The courses were followed by twenty-five students:

ANIMAL PHYSIOLOGY (15). *Three times weekly, through the year : Professor Martin.*

GENERAL BIOLOGY (8). *Three times weekly, to the end of April : Professor Martin.*

EMBRYOLOGY OF THE CHICK (10). *Thrice weekly, during May : Professor Martin.*

OSTEOLOGY (5). *Daily, from November to the end of April : Dr. Brooks.*

THEORY AND USE OF PHYSIOLOGICAL INSTRUMENTS (7). *Weekly, first half-year : Dr. Sewall.*

PHYSIOLOGY OF THE VOICE (8). *Weekly, second-half year : Dr. Sewall.*

HUMAN ANATOMY (8). *Three times weekly, to the end of March, with Practical Anatomy in the dissecting room: Dr. Winslow, of the University of Maryland.*

STRUCTURAL BOTANY (10). *Twice weekly, for one month: Dr. Sedgwick.*

LABORATORY WORK (24). *Daily, through the year: Professor Martin and Drs. Brooks, Sewall, and Sedgwick.*

PUBLIC LECTURES:

On the Human Body (249). *Four lectures: Professor Martin.*

The Theory of Development and its Philosophical Significance (197).

Seven lectures: Professor John McCrady, of the University of the South.

During the year investigations have been carried on in the **LABORATORY** (which has been open for eight hours daily) on the following subjects, and articles based on them either have been or soon will be published:—

The blood pressure and pulse in the coronary arteries of the heart; a method of isolating the mammalian heart and keeping it alive for study; the influence of variations of temperature on the pulse rate of the isolated mammalian heart; the influence of variations in arterial pressure on the pulse rate of the isolated mammalian heart; the normal temperature of the rabbit and its diurnal variations; the anatomy and physiology of parts of the nervous system of the terrapin; the interaction of weak induction currents passed simultaneously through a nerve; the histological changes occurring in pepsin glands during secretion; the mode of action on the iris of pilocarpin and other drugs; the histology of the eye of the crayfish; the development of *Lucifer*; the development of the crabs; the segmentation of the egg of bony fishes; report on the pycnogonids of the Blake expedition; the development of annelids; the development of the *Wolffian* body in *amblystoma*; the microscopic organisms present in various drinking waters, and the effect on animals of the injection of different drinking waters, (for the National Board of Health); the bacterial organisms present in various septic liquids, and the conditions leading to their development and destruction, (for the National Board of Health); the development of starch granules.

During the summer of 1881, the **CHESAPEAKE ZOOLOGICAL LABORATORY**, for the study of forms of marine life, was conducted at Beaufort, N. C. The report of its Director is given in the appendix.

The instruction in Greek was under the direction of Professor Gildersleeve. The collegiate classes were conducted by Professor C. D. Morris. The attendance was thirty-one:

GREEK SEMINARY (14). *Twice weekly, first half-year; thrice weekly, second half-year: Professor Gildersleeve.*

LECTURES ON GRAMMAR (17). *Once weekly, first half-year; twice weekly, second half-year: Professor Gildersleeve.*

COMPOSITION AND TRANSLATION (15). *Twice weekly, first half-year: Professor Gildersleeve.*

SOPHOCLES, *Electra*, *Antigone* (10). *Four times weekly, first half-year: Professor C. D. Morris.*

HERODOTUS, bks. iii, iv (6). *Four times weekly, first half-year: Professor C. D. Morris.*

THUCYDIDES, bk. iv (4). *Four times weekly, second half-year: Professor C. D. Morris.*

EURIPIDES, *Alcestis*, *Hippolytus* (5). *Four times weekly, second half-year: Professor C. D. Morris.*

PROSE COMPOSITION. *Two classes, each weekly, through the year: Professor C. D. Morris.*

NEW TESTAMENT EXEGESIS (4). *Daily, through the year: Mr. Cross.*

Students have privately read for examination the following books:

HERODOTUS, bks. i, ii (1); bks. v, vi, vii (2); bks. v, vi, vii, viii, ix (1); bks. vi, vii, viii, ix (1); bks. viii, ix (1).

EURIPIDES, *Alcestis* (2).

HOMER, *Odyssey*, bks. i-xii (1).

A course of ten lectures on Biblical Exegesis was given by Mr. Cross, with an average attendance of fourteen.

During the session of 1880-81, the SEMINARY was mainly engaged in the study of the Greek orators, especial attention being paid to the development of language and style and to the antique canons of aesthetic criticism. The members of the seminary were required to furnish in turn exegetical and critical commentaries on select portions of the orators, to prepare historical introductions, to make analyses of speeches and abstracts of rhetorical treatises. Parts of Antiphon, Andokides, Lysias, Isokrates, Isaios, and Demosthenes were studied in this way, and some of the minor orations of the four last named were compared with one another in connection with the *iudicia* of Dionysios of Halikarnassos. Besides this general work, subjects of special study in the orators were assigned to individual members of the seminary, and an effort was made to insure a personal acquaintance on the part of all the students with the works of all the orators of the Attic canon. Introductory lectures, informal examinations, and conferences were also held by the Director at suitable points in the course. Of the investigations which were carried on may be noted:—

Studies on the nominal periphrases for the verb in Antiphon and Thucydides; on the genuineness of the first Antiphontean oration; on synonyms in Antiphon; on the use of the locative formations of *πρὶν*, and of *ἐνί* in the orators; an elaborate statistic of certain syntactical characteristics of Andokides; an inquiry into the influence of technical rhetoric on the *ῥήσεις* of the Attic drama. Special work was also done in Isaios, Lykurgos, and Doinarchos.

In Latin, the classes were conducted by Minton Warren, Ph. D., with the assistance of Mr. G. H. Stockbridge, with an attendance of forty students:

LATIN RHETORICIANS (18). *Weekly, from October to March: Dr. Warren.*

TERENCE (14). *Weekly, through the year: Dr. Warren.*

TACITUS (14). *Four times weekly, first half-year: Dr. Warren.*

SELECT LETTERS OF CICERO AND PLINY (11). *Four times weekly, second half-year: Dr. Warren.*

COMPOSITION AND TRANSLATION (8). *Weekly, through the year: Dr. Warren.*

LIVY (14). *Four times weekly, first half-year: Mr. Stockbridge.*

HORACE (11). *Four times weekly, second half-year: Mr. Stockbridge.*

PROSE COMPOSITION (12). *Weekly, through the year: Mr. Stockbridge.*

Students have privately read for examination the following books:

LUCRETIVS, bks. ii, iv, vi (1).

CÆSAR, *Bellum Civile* (6).

LIVY, bks. iii, iv (1); bk. xxi (8); bk. xxiii (2); bks. xxiii, xxiv (1); bks. xxiii, xxiv, xxv (3).

HORACE, *Odes*, bks. iii, iv, *Epodes*, *Carmen Saeculare* (1); *Odes*, bk. iv, *Satires* (1).

TACITUS, *Histories*, i, ii (3).

TERENCE, *Andria*, *Phormio*, *Eunuchus* (1),

A teachers' class in the Elements of Latin was conducted by Professor C. D. Morris, on successive Saturdays, for a course of twenty lessons, with an attendance of ten.

The instruction in German was under the charge of Mr. H. C. G. Brandt, with the assistance of Mr. G. H. Stockbridge. Fifty-five students attended the classes:

GOthic (1). *Weekly, first half-year: Mr. Brandt.*

OLD HIGH GERMAN (2). *Twice weekly, through the year: Mr. Brandt.*

MAJOR COURSE. [Schiller's *Wallenstein* (12) and *Prosa in Auswahl* (9); Ballads (9); Goethe's *Faust* (10); Gryphius' *Peter Squents* (9); Lessing's *Minna v. Barnhelm* (12), *Emilia Galotti* (12), and *Nathan der Weise* (12); Prose Composition and Historical Grammar (16); Middle High German, [selections from the *Nibelungenlied* and *Walther von der Vogelweide*] (11).] *Daily, through the year: Mr. Brandt and Mr. Stockbridge.*

MINOR COURSE. [Schiller's *Prosa in Auswahl* (24); Goethe's *Egmont* (19) and *Prosa* (Hart's) (15); Helmholtz's *Populäre Wissenschaftliche Vorträge*, Heft I, (20); Humboldt's *Auswahl aus seinen Werken* (20); Prose Composition and Grammar (21).] *Daily, through the year: Mr. Brandt and Mr. Stockbridge.*

A company of advanced students met weekly through the year, for philological and literary study under Mr. Brandt, who lectured upon German Literature; lectures upon Grimm's and Verner's Laws were given by Mr. Bright, and essays were read by the students upon the principal plays of Lessing, Schiller, and Goethe.

In the Romance Languages (including Modern French) there were thirty-three students. Three of these were pursuing studies of an advanced philological character, under Mr. A. M. Elliott, and the remainder followed the major and minor courses, under Mr. Elliott, and Mr. P. B. Marcou, who taught the Modern French. Lectures in French Literature were given by M. Rabillon.

LOW LATIN AND PORTUGUESE [Seven *Inscriptions* taken from Le Blant; the *Charter* of Bruyères-le-Châtel, A. D. 670-71; eight *Formulae Andegavenses*; one *Judicius penitenciæ* taken from Mabillon; one *Joca monachorum*; the *Probi appendix*; the Reichenau Glossary. Seven cantos of *Os Lusíadas*] (3). *Twice weekly, through the year: Mr. Elliott.*

PROVENÇAL [Selections from the writings of *Peire Cardenal*, *Daude de Pradas*, *Guillem Figueira*, *Peire de Corbiac*, *Arnaut de Carcasses*, *Guiraut Riquier*, *Folquet de Lunel*, and *Raimon Ferat*; twenty Cartularies from the archives of various towns in the South of France] (3). *Three times weekly, first half-year, and twice weekly, second half-year: Mr. Elliott.*

MAJOR COURSE. [Italian: Dante, *Inferno*, with lectures on the *Divina Commedia* (6). Spanish: *Don Quijote* (5). French: Bartsch, *Chrestomathie de l'ancien Français* (extracts) (8); *Chanson de Roland*, extracts from *Les Tragiques* of Agrippa d'Aubigné, and the *Poésies* of Ronsard (8). A course of lectures on French Phonetics has been given weekly to a class of five students.] *Daily, through the year: Mr. Elliott and Mr. Marcou.*

MINOR COURSE. [Victor Hugo's *Ruy Blas*; Chateaubriand's *Génie du Christianisme* (8); Taine's *Révolution*, Vol. I; *La Poudre aux yeux*, by

Courses in English, History, and Political Science. 15

Eugène Labiche and Ed. Martin ; *La Bataille de Dames*, by Scribe and Legouvé (10).] *Daily, through the year* : Mr. Marcou.

FRENCH, Special Reading Class [Eckmann-Chatrian's *Hugues-le-Loup* ; Ed. About's *Le Roi des Montagnes*] (4). *Weekly, through the year* : Mr. Marcou.

FRENCH, Conversation Class (6). M. Rabillon.

PUBLIC LECTURES (in French) :

Satirists of France (58). *Twelve lectures* : M. Rabillon.

French Poetry, etc. (56). *Ten lectures* : M. Rabillon.

The classes in English were instructed by Mr. A. S. Cook, and were attended by twenty-nine students :

ANGLO-SAXON. *Twice weekly, first half-year* (2) ; *thrice weekly, second half-year* (7).

The study of Anglo-Saxon Poetry and Laws, and of Historical English Grammar was also followed by some of the more advanced students during the second half-year.

SHAKESPEARE, CHAUCER, etc. (6). *Daily, through the year*.

A class of fourteen in English Prose Style was taught during the first half-year, and a class of nine in General English Literature during the second half-year.

PUBLIC LECTURES :

Development of the Modern English Novel (195). *Twelve lectures* : Mr. Lanier.

Englishmen before the Conquest (196). *Six lectures* : Mr. Cook.

Laws of Verse (285). *One lecture* : Professor Sylvester.

The courses in History and Political Economy were taken by forty students. Classes in Constitutional History and in Modern History were directed by H. B. Adams, Ph. D. The instruction in Political Economy was given by H. C. Adams, Ph. D. Austin Scott, Ph. D., directed a class in American Constitutional History.

HISTORY OF LOCAL SELF-GOVERNMENT IN THE UNITED STATES (80).

Meeting in the Library of the Historical Society : Dr. H. B. Adams.

After a course of lectures, investigations were undertaken upon the following topics, among others :—the parish system of South Carolina ; the

county system of Virginia; the township system of Michigan and the Northwest; the municipal government of New York.

COMPARATIVE CONSTITUTIONAL HISTORY (12). *Meeting at the Peabody Institute: Dr. H. B. Adams.*

The following themes were made the subject of individual research:— a comparison between mediæval and modern ideas of the state; influence of nationality upon state-life; relative capacity of the different races for civil society; the fourth estate in mediæval and modern times.

AMERICAN CONSTITUTIONAL HISTORY (26). *Meeting in the Library of the Historical Society: Dr. Austin Scott.*

The constitution was studied in its adoption, and in the various phases of its development up to the final decision in the Dartmouth College case in 1819, and special topics were assigned for individual research to members of the class.

MODERN HISTORY [Modern Absolutism and Revolution] (88). *Four times weekly, first half-year: Dr. H. B. Adams.*

ELEMENTS OF INTERNATIONAL LAW (38). *Four times weekly, for two months: Dr. H. B. Adams.*

POLITICAL ECONOMY (17). *Daily, first half-year: Dr. H. C. Adams.*

FINANCE (15). *Weekly, first half-year: Dr. H. C. Adams.*

PUBLIC LECTURES:

Teutons in Church and State (212). *Five lectures: Dr. H. B. Adams.*

During the second half-year courses in the History of German Philosophy and in Aristotle's Ethics were conducted by Professor G. S. Morris, with an attendance of fourteen students.

The courses in Logic were directed by Mr. C. S. Peirce, and included daily lectures through the year. The advanced class was attended by nine and the elementary class by five students.

Classes were also instructed in Elementary Psychology, by Allan Marquand, Ph. D.; in Physiography, by S. F. Clarke, Ph. D.; in Drawing, by Mr. Hugh Newell; and in Elocution, by Mr. C. L. Woodworth.

CHESAPEAKE ZOOLOGICAL LABORATORY.

The fourth session of the Chesapeake Zoölogical Laboratory was held at Beaufort, N. C., and was attended by eleven persons. The director continues to be Dr. W. K. Brooks, whose report is given in the appendix.

PUBLIC LECTURES.

The public lectures were continued during the year with unabated interest. By special request of the Trustees, a larger number than usual were given by resident members of the academic body. The subjects and lecturers were as follows :

Subject.	Lecturer.	Average Attendance.
Selected Topics in Chemistry, (4), . . .	Ira Remsen, . . .	229
The Human Body, (4), . . .	H. N. Martin, . . .	249
Light, (4), . . .	C. S. Hastings, . . .	208
Conservation of Energy, (4), . . .	H. A. Rowland, . . .	188
English Literature, (12), . . .	Sidney Lanier, . . .	195
Laws of Verse, (1), . . .	J. J. Sylvester, . . .	235
Sun and Radiant Energy, (6), . . .	S. P. Langley, . . .	207
Early England, (6), . . .	A. S. Cook, . . .	196
History of German Philosophy, (6), . . .	G. S. Morris, . . .	148
Teutons in Church and State, (5), . . .	H. B. Adams, . . .	212
Theory of Development, (7), . . .	J. McCrady, . . .	197
Photophone and Spectrophone, (1), . . .	A. Graham Bell, . . .	235
Satirists of France (<i>in French</i>), (12), . . .	L. Rabillon, . . .	58
French Poetry, etc. (<i>in French</i>), (10), . . .	L. Rabillon, . . .	56

Besides these lectures in Hopkins Hall, many of the instructors lectured by invitation before associations in different parts of the city and in its neighborhood.

INCREASE OF THE COLLECTIONS OF BOOKS AND APPARATUS.

Liberal purchases have been made for the increase of our books and apparatus. The Library now numbers ten thousand five hundred and seventy-two bound volumes, of which two thousand five hundred and forty-one have been received during the year. The university is indebted to Prince L. L. Bonaparte, for several privately printed volumes which embody his important linguistic studies, and to the heads of St. Mary's Seminary, Baltimore, and of Woodstock College for valuable theological and philosophical writings. Mr. Henry Holt, of New York, has generously given to the library copies of most of his recent standard publications,—in continuance of previous similar contributions. A remarkable collection of works on logic, made by Professor C. S. Peirce, was acquired by purchase, and additions were generously made to the collection by the same gentleman.

The reading room continues to be well supplied with the best scientific and literary periodicals, to the number of two hundred and eighty-six. In the Register for 1881, a list of these journals and of those taken in other institutions of Baltimore was printed. The entire number thus accessible is six hundred and seventy-six. The amount expended during the last five years for books and periodicals

is \$32,082.92, and for apparatus \$38,245.99. Beside the purchases many important instruments have been made in the mechanician's shop maintained by the university.

PUBLICATIONS AND SOCIETIES.

The periodicals which are fostered by the funds of the university are widely circulated in other countries as well as in our own, and already many valuable publications have been received in exchange for them. The American Journal of Mathematics, edited by Professor Sylvester, has completed its third volume; the American Chemical Journal, edited by Professor Remsen, has entered on its third volume; the American Journal of Philology, edited by Professor Gildersleeve, on its second. The papers from the Biological Laboratory, under the editorial care of Professor Martin, with the aid of Dr. Brooks, have been collected in one volume, and the first part of the second volume has also been printed. An arrangement has also been made with the Journal of Physiology, of Cambridge, England, by which it is now published in this country under the auspices of this institution.

Current information regarding the university (including reports of important communications to the various societies here established) is given in the Official Circulars, of which five numbers were printed during the year.

The Scientific, Philological, Historical, and Metaphysical Associations, composed of the professors and advanced students, have met frequently during the year, for the presentation and discussion of papers or oral communications, and abstracts of the more important papers read at their sessions have been printed.

GRADUATES OF THE YEAR.

The number of undergraduates, who have come forward to the baccalaureate degree, during the year, has been twelve, making the whole number of Bachelors of Arts, here created in three years, thirty-one.

The names of those graduating in 1880-81 are as follows :

WILLIAM W. BADEN, Baltimore.	JAMES E. KEELER, Mayport, Fla.
HENRY J. BOWDOIN, Baltimore.	EDWIN G. RICHARDSON, Baltimore.
JOHN W. BROWN, Govanstown.	ADONIRAM J. ROBINSON, Baltimore.
DAVID T. DAY, Baltimore.	HENRY ROLANDO, Baltimore.
WILLIAM H. HOWELL, Baltimore.	LEE SALE, Louisville, Ky.
JOHN JOHNSON, Owings Mills.	MACTIER WARFIELD, Baltimore.

Nine candidates, who had presented the requisite theses and also passed the examinations successfully, were made Doctors of Philosophy. The whole number of persons admitted among us to this second degree is twenty-four. Nearly all of these are looking forward to the profession of teaching as their career in life ; nineteen of them have already

received appointments in colleges and other educational establishments.

The names of the Doctors of Philosophy (1880-81) and the titles of their theses are as follows :—

LOUIS BEVIER, of Marblatown, N. Y., A. B., Rutgers College, 1878. His principal study was Greek, the subsidiary, Sanskrit, (in which he was examined by Professor C. R. Lanman, now of Harvard University), and Latin. He submitted a thesis "On the Genuineness of the First Antiphontean Oration."

R. DORSEY COALE, of Baltimore. His principal study was Chemistry, the subordinate, Physics. His thesis, "On Sulphamine- and Sulphoisophthalic Acids," has been printed, in modified form, in the *American Chemical Journal*, (vol. iii, no. 8.)

EDWARD A. FAY, of Washington, D. C., A. B., University of Michigan, 1862, and A. M., 1865. His principal study was the Romance Languages, the subordinate, Latin. His thesis, "On the Conditional Relations in the Romance Languages," was submitted to Professor Austin Stickney, of New York, formerly of Trinity College, Hartford.

LAWRENCE B. FLETCHER, of Marlboro, N. Y., A. B., Columbia College, 1877, and A. M., 1880; (Fellow of Columbia College, 1877-80.) His principal study was Physics, the subordinate, Chemistry. He submitted a thesis "On the Determination of the Mechanical Equivalent of Heat by Electrical Means," which was referred to Professor John Trowbridge, of Harvard University, and will shortly be printed.

SAMUEL GARNER, of Annapolis, A. B., St. John's College, 1871. His principal study was the Romance Languages, the subordinate, German. He submitted a thesis on "The Gerundial Construction in the Romance Languages," which was examined by Professor F. Stengel, of Columbia College.

EDWARD M. HARTWELL, of Littleton, Mass., A. B., Amherst College, 1873, and A. M., 1876. His principal study was Animal Physiology, the subordinate, Animal Histology and Animal Morphology. He submitted a thesis, "Notes on some points in the Anatomy and Physiology of the Slider Terrapin, (*Pseudemys rugosa*)," which will be printed in a forthcoming number of the *Studies from the Biological Laboratory*.

WILLIAM T. SEDGWICK, of Farmington, Conn., Ph. B., Yale College, 1877. His principal study was Animal Physiology, the subordinate, Animal Morphology and Vegetable Physiology. His thesis, on "The Influence of Quinine on the Reflex Excitability of the Spinal Cord," has been printed in *The Journal of Physiology*, (vol. iii, no. 1).

CHRISTIAN SIHLER, of Cleveland, Ohio, Concordia College, 1866; M. D., University of Michigan, 1871. His principal study was Animal Physiology, the subordinate, Animal Morphology and Chemistry. His

thesis on "The Formation of Bone and Tooth," was submitted to Dr. George A. Otis, of the U. S. Surgeon General's Office, Washington.

EDMUND B. WILSON, of Geneva, Ill., Ph. B., Yale College, 1878. His principal study was Animal Morphology, the subordinate, Animal Histology, and Animal Physiology. His thesis, on "The Origin and Significance of the Metamorphosis of Actinotrocha," has been printed in the *Quarterly Journal of Microscopical Science*, (April, 1881).

Two social assemblies were held in connection with the bestowal of degrees, the first on Commemoration Day, February 22d, 1881, and the second at the close of the year, June 6th, 1881. There was also a gathering of the officers and students, as heretofore, at the opening of the academic year.

On the 12th of February, the university received a visit from the President of the United States, RUTHERFORD B. HAYES, who was escorted to the Hopkins Hospital by some of the Trustees, and afterwards to the halls of the university. As a token of respect for his official and personal character the university conferred upon him the honorary degree of Doctor of Laws.

The university extended its hospitality to the American Library Association, Justin Winsor, Esq., of Harvard College, President, on the 11th of February, 1881. The Medical and Chirurgical Faculty of Maryland held its annual meeting in Hopkins Hall,—and in the same place, preliminary meetings were held for organizing a Civil Service Reform Association, and a union of local charitable societies under the name of the Charity Organization Society of Baltimore.

PERSONAL CHANGES.

Death has deprived the Board of two of the members originally selected by the founder of the university to administer his trust. Mr. Galloway Cheston, who had been the President of the Board from its organization, died on the ninth of March, 1881, in his seventy-fifth year. During all his mature life he had been a merchant of Baltimore, filling with credit from time to time positions of financial responsibility, but shrinking with native modesty from other conspicuous stations to which the respect of his fellow citizens would have called him. He took an active interest in the university affairs, and was rarely absent from the meetings of the Trustees, giving his steady influence in favor of maintaining the highest ideal of university education. Soon afterwards, on the twenty-eighth of May, 1881, Mr. William Hopkins, a cousin of the founder, and the Secretary of the Board, was removed by death, at the age of sixty-seven years. He had been engaged during most of his life in business, and had won the confidence and respect of those who knew him by his integrity and adherence to what he considered right.

When the work of the session was concluded, Mr. Sidney Lanier,* who had been for two years

*A commemorative address by Dr. Wm. Hand Browne, delivered in Hopkins Hall, October 22, has been printed.

Lecturer on English Literature, sought to recruit his failing strength by a resort to the mountainous regions of North Carolina,—but a long continued disease had already made such progress that the fatal termination could not be postponed, and he died September 7, 1881, in the fortieth year of his age. He was favorably known in the literary world by his poems and other writings, and was greatly beloved by a circle of admiring friends.

The number of Associates has been increased by the appointment in Biology, of Henry Sewall, Ph. D., formerly an assistant here, and recently a student in the university of Leipsic; in Sanskrit, of Maurice Bloomfield, Ph. D., who continued the study of Comparative Philology at Leipsic and Berlin, after graduating here two years ago; in Mathematics, of Thomas Craig, Ph. D., who has been connected with this university since its opening and has also, of late, been an adjunct of the United States Coast and Geodetic Survey; in Biology, of William T. Sedgwick, Ph. D., and in English, of Henry Wood, Ph. D. (Leipsic), recently one of the teachers in the Friends' School, Providence.

DANIEL C. GILMAN,

President of the Johns Hopkins University.

September, 1881.

APPENDIX.

A.

Academic Staff, 1876-82.*

PRESIDENT.

	Appointed.
DANIEL C. GILMAN,	December 30, 1874.

PROFESSORS.

	Appointed.
BASIL L. GILDERSLEEVE, <i>Greek</i> ,	1876.
J. J. SYLVESTER, . . . <i>Mathematics</i> ,	1876.
IRA REMSEN, <i>Chemistry</i> ,	1876.
HENRY A. ROWLAND, . . . <i>Physics</i> ,	1876.
H. NEWELL MARTIN, . . . <i>Biology</i> ,	1876.
CHARLES D. MORRIS, . . . <i>Classics</i> ,	1876.

ASSOCIATES.

	Years of Service.
JOHN M. CROSS, . . . <i>Greek</i> ,	1876-1881.
PHILIP R. UHLER, . . . <i>Natural History</i> ,	1876-
AUSTIN SCOTT, <i>History</i> ,	1876-
A. MARSHALL ELLIOTT, . . <i>Romance Philology</i> ,	1876-
THOMAS C. MURRAY, . . . <i>Shemitic</i> ,	1876-1879.
HERMAN C. G. BRANDT, . . <i>German</i> ,	1876-
WILLIAM K. BROOKS, . . . <i>Biology</i> ,	1876-
HARMON N. MORSE, . . . <i>Chemistry</i> ,	1876-
ROBERT RIDGWAY, <i>Natural History</i> ,	1876-1877.
WILLIAM E. STORY, <i>Mathematics</i> ,	1876-
ARTHUR W. TYLER, <i>Librarian</i> ,	1876-1878.
CHARLES S. HASTINGS, . . . <i>Physics</i> ,	1876-
CHARLES R. LANMAN, . . . <i>Sanskrit</i> ,	1877-1880.
HERBERT B. ADAMS, <i>History</i> ,	1878-
ALBERT S. COOK, <i>English</i> ,	1879-1881.
MINTON WARREN, <i>Latin</i> ,	1879-
WILLIAM HAND BROWNE, <i>Librarian</i> ,	1879-

*The names in each group are arranged in the order of appointment.

		Years of Service.
HENRY SEWALL, . . .	<i>Biology, . . .</i>	1880—
THOMAS CRAIG, . . .	<i>Mathematics, . . .</i>	1880—
MAURICE BLOOMFIELD, . . .	<i>Sanskrit, . . .</i>	1881—
WILLIAM T. SEDGWICK, . . .	<i>Biology, . . .</i>	1881—
HENRY WOOD, . . .	<i>English, . . .</i>	1881—

LECTURERS.

SIMON NEWCOMB, . . .	<i>Astronomy, . . .</i>	1876.
LÉONCE RABILLON, . . .	<i>French, . . .</i>	1876—
JOHN S. BILLINGS, . . .	<i>Medical History, etc.</i>	1877.
FRANCIS J. CHILD, . . .	<i>Early English, etc.,</i>	1877—1878.
THOMAS M. COOLEY, . . .	<i>Law, . . .</i>	1877—1879.
JULIUS E. HILGARD, . . .	<i>Geodetic Surveys, . . .</i>	1877.
JAMES RUSSELL LOWELL, . . .	<i>Romance Literature, . . .</i>	1877.
JOHN W. MAULET, . . .	<i>Technological Chemistry, . . .</i>	1877—1878.
FRANCIS A. WALKER, . . .	<i>Political Economy, . . .</i>	1877—1878.
WILLIAM D. WHITNEY, . . .	<i>Comparative Philology, . . .</i>	1877.
WILLIAM F. ALLEN, . . .	<i>History, . . .</i>	1878.
WILLIAM JAMES, . . .	<i>Psychology, . . .</i>	1878.
GEORGE S. MORRIS, . . .	<i>Philosophy, . . .</i>	1878—
J. LEWIS DIMAN, . . .	<i>History, . . .</i>	1879.
H. VON HOLST, . . .	<i>History, . . .</i>	1879.
WILLIAM G. FARLOW, . . .	<i>Botany, . . .</i>	1879.
J. WILLARD GIBBS, . . .	<i>Theoretical Mechanics, . . .</i>	1879.
SIDNEY LANIER, . . .	<i>English Literature, . . .</i>	1879—1881.
CHARLES S. PEIRCE, . . .	<i>Logic, . . .</i>	1879—
JOHN TROWBRIDGE, . . .	<i>Physics, . . .</i>	1880.
A. GRAHAM BELL, . . .	<i>Phonology, . . .</i>	1881.
S. P. LANGLEY, . . .	<i>Physics, . . .</i>	1881.
JOHN MCCRADY, . . .	<i>Biology, . . .</i>	1881.
JAMES BRYCE, . . .	<i>Political Science, . . .</i>	1881.
EDWARD A. FREEMAN, . . .	<i>History, . . .</i>	1881.
JOHN J. KNOX, . . .	<i>Banking, . . .</i>	1881.
ARTHUR CAYLEY, . . .	<i>Mathematics, . . .</i>	1882.
WILLIAM W. GOODWIN, . . .	<i>Greek, . . .</i>	1882.
G. STANLEY HALL, . . .	<i>Psychology, . . .</i>	1882.
SIMON NEWCOMB, . . .	<i>Taxation, . . .</i>	1882.
RICHARD M. VENABLE, . . .	<i>Constitutional Law, . . .</i>	1882.

INSTRUCTORS AND ASSISTANTS.

	Years of Service.
HENRY SEWALL, . . . <i>Biology</i>, . . . .	. 1876-1878.
SAMUEL F. CLARKE, . . . <i>Biology</i>, . . . .	. 1879-1881.
FABIAN FRANKLIN, . . . <i>Mathematics</i>, . . . .	. 1879-
LYMAN B. HALL, . . . <i>Chemistry</i>, . . . .	. 1879-1880.
CHRISTIAN SIHLER, . . . <i>Biology</i>, . . . .	. 1879-1880.
HENRY C. ADAMS, . . . <i>Political Economy</i>, . . . .	. 1879-1881.
THOMAS CRAIG, . . . <i>Mathematics</i>, . . . .	. 1879-1880.
CHAS. L. WOODWORTH, . . . <i>Elocution</i>, . . . .	. 1879-
WILLIAM T. SEDGWICK, . . . <i>Biology</i>, . . . .	. 1880-1881.
EDWIN H. HALL, . . . <i>Physics</i>, . . . .	. 1880-1881.
GEORGE H. STOCKBRIDGE, . . . <i>Latin and German</i>, . . . .	. 1880-1881.
PHILIPPE B. MARCOU, . . . <i>French</i>, . . . .	. 1880-
HUGH NEWELL, . . . <i>Drawing</i>, . . . .	. 1880-
R. DORSEY COALE, . . . <i>Chemistry</i>, . . . .	. 1881-
RICHARD T. ELY, . . . <i>Political Economy</i>, . . . .	. 1881-
LAWRENCE B. FLETCHER, . . . <i>Physics</i>, . . . .	. 1881.
GEORGE F. NICOLASSEN, . . . <i>Greek and Latin</i>, . . . .	. 1881-
BENJAMIN E. SMITH, . . . <i>Philosophy</i>, . . . .	. 1881-
EDMUND B. WILSON, . . . <i>Biology</i>, . . . .	. 1881-

B.

Roll of Fellows.*

The following list gives the names of all persons who have been selected by the authorities and appointed to Fellowships. Though, in a few cases, by reason of promotion or other causes, the persons designated have not entered upon the Fellowships, their names are given to exhibit fully the working of this system of appointment.

Where no location is stated, the Johns Hopkins University is to be understood.

1. HENRY CARTER ADAMS, Ph. D., Non-Resident Professor at Cornell University, 1881-82.

From Waterloo, Iowa; Denmark Academy, Iowa, 1870; A. B., Iowa College, 1874, and A. M., 1877; Ph. D., Johns Hopkins, 1878; Lecturer upon Political Economy, at Cornell University, 1879-80, at Johns Hopkins University, 1879-81, at University of Michigan, 1880-82; (*Political Science*, 1876-79.)

History of Taxation in the United States, (Graduating Thesis, J. H. U., 1878), published under the title, Zur Geschichte der Besteuerung in den Vereinigten Staaten von Amerika in der Periode von 1789-1816. (*Zeitsch. f. d. gesam. Staatswissenschaft*, Tübingen, 1879.)

Cooperation. (*Am. Soc. Sc. Assoc.*, 1878.)

Historical Position of Socialism in the Development of Political Economy. (*Penn. Monthly*, 1879.)

Payment of Public Debts. (*International Review*, September, 1881.)

Democracy. (*New Englander*, November, 1881.)

Modern Public Debts. (*International Review*, March, 1881.)

Irish Land Question. (*New Englander*, February, 1881.)

Outline of Lectures upon Political Economy. (*Baltimore*, 1881.)

2. HERBERT BAXTER ADAMS, Ph. D., Associate in History.

From Amherst, Mass.; Phillips Academy, Exeter, N. H., 1868; A. B., Amherst, 1872; Instructor at Williston Seminary, Easthampton, Mass., 1872-73; Student of History and Political Science at Heidelberg and Berlin, 1873-76; Ph. D., Heidelberg, 1876; Lecturer on History at Smith College, Northampton, Mass., 1878-81; (*History*, 1876-78.)

Maryland's Influence in Founding a National Commonwealth, or the History of the Accession of Public Lands by the Old Confederation. (*Maryland Historical Society, Fund Publication*, No. 11, 1877.)

The Germanic Origin of New England Towns. (*Harvard University Bulletin*, June, 1881.)

Salem Commons and Commoners, or the Economic Beginnings of Massachusetts. (*Bulletin of the Essex Institute*, Aug. 30, 1881. To be published in full in the *Historical Collections of the Institute*.)

Tithingmen. (*American Antiquarian Society, Proceedings*, Vol. I, Part 3.)

Constables. (*New England Historic-Genealogical Society, Proceedings*, April, 1882.)

3. WILLIAM KEITH BROOKS, Ph. D., Associate in Biology, and Director of Chesapeake Zoölogical Laboratory.

From Cleveland, Ohio; A. B., Williams, 1870; Ph. D., Harvard, 1874; Assistant, Boston Society of Natural History, 1874-75; (*Biology*, 1876; appointed Associate before entering on the Fellowship.)

On an Organ of Sense in the Lamellibranchiate Genus Yoldia. (*Proc. Amer. Assoc.*, 1874.)

Embryology of the Fresh-Water Mussel. (*Proc. Amer. Assoc.*, 1875.)

Embryology of Salpa. (*Proc. Boston Soc. Nat. Hist.*, 1875; *Archiv. f. Naturgeschichte*, 1876.)

The Affinity of the Mollusca and the Molluscoida. (*Proc. Boston Soc. Nat. Hist.*, 1875; *Ann. & Mag. Nat. Hist.*, 1876.)

* See statement of System of Fellowships on page 46.

The Development of Salpa. (*Bull. Mus. Comp. Zool., Cambridge, No. 14.*)
 A Remarkable Life-History. (*Am. Nat., Nov., 1876.*)
 A Provisional Hypothesis of Pangenesis. (*Am. Nat., March, 1877.*)
 Parthenogenesis in Vertebrates and Mollusca. (*Am. Nat., Oct., 1877.*)
 Preliminary Observations upon the Development of the Marine Prosobranchiate Gastropods. (*Studies from the Biol. Lab., J. H. U., 1879.*)
 The Development of Lingula and the Systematic Position of the Branchiopoda. (*Scientific Results, Chesapeake Zool. Lab., 1879.*)
 Du développement de la Lingula et de la position Zoologique des Branchiopoda. (*Arch. f. Zool. exp., 1881.*)
 The Larval Stages of Squilla empusa. (*Scientific Results, Chesapeake Zool. Lab., 1879.*)
 Embryology of the Fresh-Water Pulmonates. (*Studies from the Biol. Lab., J. H. U., 1879.*)
 Abstract of Observations on the Development of the American Oyster. (*Zool. Anzeiger, 1879.*)
 The Artificial Fertilization of Oyster Eggs and the Propagation of the American Oyster. (*Am. Jour. of Science, 1879.*)
 The Development of the American Oyster. (*Report of the Maryland Fish Commission, and Studies from the Biol. Lab., J. H. U., 1880.*)
 The Acquisition and Loss of a Food Yolk in Molluscan Eggs. (*Studies from the Biol. Lab., J. H. U., 1880; 10 plates.*)
 The Development of the Cephalopoda and the Homology of the Cephalopod Foot. (*Am. Jour. of Science, 1880.*)
 The Rhythmical Character of Segmentation. (*Am. Jour. of Science, 1880.*)
 Budding in Free Medusae. (*Am. Nat., Sept., 1880.*)
 Embryology and Metamorphosis of the Sergestidae. (*Zool. Anzeiger, Nov., 1880.*)
 The Young of the Crustacean Lucifer, A Nauplius. (*Am. Nat., Nov., 1880.*)
 The Development of the Squid. (*Anniv. Mem. Boston Soc. Nat. Hist., March, 1881; 3 plates.*)
 Alternation of Periods of Rest with Periods of Activity in the Segmenting Eggs of Vertebrates. (*Studies from the Biol. Lab., J. H. U., 1881; 1 plate.*)
 The First Zoea of Porcellana. (With E. B. Wilson; *Studies from the Biol. Lab., J. H. U., 1881; 2 plates.*)
 List of the Medusae of Beaufort, N. C. (*Studies from the Biol. Lab., J. H. U., 1882.*)
 Origin of the Eggs of Salpa. (*Studies from the Biol. Lab., J. H. U., 1882; 1 plate.*)
 Lucifer: A Study in Morphology. (*Proc. Royal Soc., London, 1881.*)
 The Development of Lucifer. (*Phil. Trans. Royal Soc., London, 1882; 11 plates.*)
 Handbook of Vertebrate Zoology. (*Boston, Cassino, 1882.*)
 Gamisao and the Discovery of Alternation of Generations. (*Zool. Anzeiger; in press.*)
 The Development of the Digestive Tract in Mollusca. (*Proc. Boston Soc. Nat. Hist., 1879.*)

4. THOMAS CRAIG, Ph. D., Associate in Applied Mathematics.

From Pittston, Pa.; C. E., Lafayette, 1875; Ph. D., Johns Hopkins, 1878;
 Lecturer on Mathematics, 1879-81; U. S. Coast & Geodetic Survey, 1879-81;
 (*Mathematics, 1876-78; Physics, 1878-79.*)

Representation of one Surface upon another, and on some points in the Theory of the Curvature of Surfaces. (*Graduating Thesis, J. H. U., 1878.*)
 Motion of a Point upon the Surface of an Ellipsoid. (*Am. Jour. of Math., 1878.*)
 Mathematical Theory of Fluid Motion. (*Van Nostrand's Eng. Mag., 1879.*)
 Wave and Vortex Motion. (*N. Y., Van Nostrand, 1879.*)
 Motion of a Solid in a Fluid. (*N. Y., Van Nostrand, 1879.*)
 Motion of a Solid in a Fluid. (*Am. Jour. of Math., 1879.*)
 General Differential Equation for Developable Surfaces. (*Jour. of Franklin Inst., 1879.*)
 Treatise on the Mathematical Theory of Projections. (*U. S. Coast Survey, 1879.*)
 Projection of the General Locus of Space of Four Dimensions into Space of Three Dimensions. (*Am. Jour. of Math., 1879.*)
 Motion of an Ellipsoid in a Fluid. (*Am. Jour. of Math., 1879.*)
 Motion of Viscous Fluids. (*Jour. of Franklin Inst., 1880.*)
 Steady Motion in Viscous Fluids. (*Philos. Mag., 1880.*)
 Orthomorphic Projection of the Ellipsoid upon a Sphere. (*Am. Jour. of Math., 1880.*)
 On Certain Possible Cases of Steady Motion in a Viscous Fluid. (*Am. Jour. of Math., 1881.*)
 Distortion of an Elastic Sphere. (*Jour. für die reine und angewandte Mathematik, 1881.*)
 On Certain Partial Differential Equations analogous to those of Hydrodynamics. (*Am. Acad. of Science, 1881.*)
 Note on Abel's Theorem. (*London Math. Soc., Proc., 1881.*)

5. JOSHUA WALKER GORE, Assistant Professor of Mathematics at the University of Virginia.

From Frederick County, Va.; C. E., University of Virginia, 1875; Professor of Natural Science, Southwestern Baptist University, 1878-81; (*Mathematics, 1876-78.*)

6. GEORGE BRUCE HALSTED, Ph. D., Instructor in Post-Graduate Mathematics at Princeton College.

From New York City; A. B., Princeton, 1875, and A. M., 1878; Fellow of Princeton College, and Student at School of Mines, Columbia College, 1875-76; Student at Berlin, 1877; Ph. D., Johns Hopkins, 1879; (*Mathematics*, 1876-78.)

Basis for a Dual Logic. (*Graduating Thesis, J. H. U.*, 1879.)
 Spencer's Classification of the Abstract Sciences. (*Pop. Sc. Mon.*, 1877.)
 The New Ideas about Space. (*Pop. Sc. Mon.*, 1877.)
 Bibliography of Hyper-Space and Non-Euclidean Geometry. (*Am. Jour. of Math.*, 1878-79.)
 Note on the First English Euclid. (*Am. Jour. of Math.*, 1879.)
 Historical Sketch of Exact Rectilinear Motion. (*Van Nostrand's Eng. Mag.*, 1878.)
 Mechanical Conversion of Motion. (*Van Nostrand's Eng. Mag.*, 1878; reprinted in "World of Science." London.)
 Jevons's Criticism of Boole's Logic. (*Mind*, 1878.)
 Boole's Logical Method. (*Jour. of Spec. Philos.*, 1878.)
 Statement and Reduction of Syllogism. (*Jour. of Spec. Philos.*, 1878.)
 Algorithmic Division in Logic. (*Jour. of Spec. Philos.*, 1879.)
 Modern Mathematicians as Educators. (*Nassau Lk. Mag.*, XXXII, 2.)
 Is Formal Logic a Branch of Mathematics. (*Nassau Lk. Mag.*, XXXII, 3.)
 Algebras, Spaces, Logics. (*Pop. Sc. Mon.*, 1880.)
 Mensuration: Metrical Geometry. (*Boston Ginn, Heath & Co.*, 1881.)

7. EDWARD HART, Ph. D., Assistant Professor of Chemistry at Lafayette College.

From Doylestown, Pa.; S. B., Lafayette, 1874; Ph. D., Johns Hopkins, 1879; (*Chemistry*, 1876-78.)

Nitrosulphobenzoic Acids and their Derivatives. (*Graduating Thesis, J. H. U.*, 1879; *Am. Chem. Jour.*, 1879.)
 Volumetric Estimation of Sulphuric Acid. (*Am. Chemist*, VI, 284.)
 Volumetric Estimation of Iron. (*Chem. News*, XXXIV, 65.)
 Ueber Isomere Sulfosäuren aus Paranitrotoluene. (*Ber. d. deut. chem. Ges.*, X, 1046; *Notes from Chem. Lab., J. H. U.*, 1877.)
 Handbook of Volumetric Analysis. (*N. Y., Wiley*, 1878.)
 Stopcock of Easy Construction. (*Am. Chemist*, 1879.)
 New Experiment for Showing the Gas in the Interior of a Flame. (*Am. Chemist*, Dec., 1874.)
 An Analysis of a Specimen of Silver-Gray or Glazy Iron. (*Trans. Amer. Inst. Min. Eng.*, Vol. 5.)

8. DANIEL WEBSTER HERING, Professor of Mathematics at Western Maryland College, Westminster.

From Mechanicstown, Md.; Ph. B., Yale, 1872; Assistant Engineer, Berks County Railroad, Pa., 1873-74; C. E., Yale, 1878; Assistant Engineer, Baltimore and Cumberland Valley Railroad, 1878-80; (*Engineering*, 1876-78.)

9. MALVERN WELLS ILES, Ph. D., Chemist, Leadville, Colorado.

From Davenport, Iowa; Ph. B., Columbia, 1875, and Ph. D., 1877; (*Chemistry*, 1876-78.)

A New Qualitative Reaction for Boracic Acid. (*Am. Chemist*, 1876.)
 On the Action of Ozone upon Milk. (*Sc. Amer.*, 1877.)
 On the Oxidation of Sulpho-Acids derived from Metaxylene. (*Notes from Chem. Lab., J. H. U.*, 1877.)
 On the Oxidation of Xylenesulphonic Acids. (With Prof. Remsen; *Notes from Chem. Lab., J. H. U.*, 1877-78; *Am. Chem. Jour.*, 1879.)
 A New Method for the Quantitative Estimation of Sulphur. (*Notes from Chem. Lab., J. H. U.*, 1878.)
 Chloro-Bromide of Lead. (*Am. Chem. Jour.*, 1881.)
 A New Manganese Mineral. (*Am. Chem. Jour.*, 1882.)

10. WILLIAM WHITE JACQUES, Ph. D., Electrician of the American Bell Telephone Co., Boston, Mass.

From Newburyport, Mass.; S. B., Mass. Institute of Technology, 1876; Ph. D., Johns Hopkins, 1879; (*Physics*, 1876-79.)

Light Transmitted by One or More Plates of Glass. (*Proc. Am. Acad.*, 1875.)
 Answer to M. Jamin's Objections to Ampère's Theory. (*Proc. Am. Acad.*, 1875.)
 Diffraction of Sound. (*Proc. Am. Acad.*, 1876.)
 An Experimental Proof of the Law of Inverse Squares for Sound. (*Proc. Am. Acad.*, 1876.)
 Effect of the Motion of Air within an Auditorium upon its Acoustic Qualities. (*Jour. of Franklin Inst.*, 1878.)
 Velocity of Very Loud Sounds. (*Am. Jour. of Science*, 1879.)
 Diamagnetic Constants of Bismuth and Calc Spar Crystals in Absolute Measure. (*Am. Jour. of Science*, 1879.)
 Distribution of Heat in the Spectra of Various Sources of Radiation. (*Graduating Thesis, J. H. U.*, 1879; *Proc., Am. Acad.*, 1879.)

11. CHARLES ROCKWELL LANMAN, Ph. D., Professor of Sanskrit at Harvard University.

From Norwich, Conn.; A. B., Yale, 1871, and Ph. D., 1873; Student at Berlin, 1873-74, Tubingen, 1874-75, Leipzig, 1875-76; Secretary and Curator of the American Philological Association, 1879-81; Associate in Sanskrit, 1877-80; (*Sanskrit*, 1876-77.)

Contributions to Grassmann's Wörterbuch zum Rig-Veda. (*Leipzig*, 1873-75.)
 Compendium of Sanskrit Paradigms. (1876.)
 A Conjectural Emendation of Rig-Veda i. 30. 11. (*Am. Or. Soc. Proc.*, 1877.)
 On Tentative Linguistic Forms. (*Am. Or. Soc. Proc.*, 1878.)
 Noun-Inflection in the Veda. (*Am. Or. Soc. Jour.*, Vol. X., pp. 325-601.)
 On Catalectic Vedic Verses of Seven Syllables. (*Am. Or. Soc. Proc.*, 1880.)
 A Sanskrit Reader, with Dictionary and Notes. Parts I (Reader) and II (Dictionary) (*In press.*)

12. DAVID MCGREGOR MEANS, New York City.

From Andover, Mass.; A. B., Yale, 1868; Professor of Political and Mental Science in Middlebury College, Vermont, 1877-80; (*Political Science*, 1876-77.)

The Pardoning Power. (*New Englander*, 1875.)
 The Trouble with the Caucus. (*New Englander*, 1875.)
 Are all Criminals Insane? (*New Englander*, 1876.)
 Chinese Immigration and Political Economy. (*New Englander*, 1877.)
 Aristotle: His Theology (*Bibliotheca Sacra*, 1877); His Theory of Ideas (*ib.*, 1878); His Ethics (*ib.*, 1879.)
 Nominalism. (*Mind*, 1879.)
 Taxation of Mortgages. (*New Englander*, 1880.)
 Data of Ethics. (*Bibliotheca Sacra*, 1880.)
 H. Spencer's Ethics. (*Mind*, 1880.)

13. HARMON NORTHPROP MORSE, Ph. D., Associate in Chemistry.

From Cambridge, Vt.; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; Instructor in Chemistry in Amherst College, 1875-76; (*Chemistry*, 1876; *appointed Associate before entering upon the Fellowship.*)

Benzoylamidophenols. (*Ber. d. deut. chem. Ges.*, 1874.)
 Ueber Einige Derivate des Ortho- und Paramidophenols. (*Inaugural Dissertation, Göttingen*, 1875.)
 On the Oxidation of Bromethyltoluene and of Similar Substitution Products. (*Notes from Chem. Lab., J. H. U.*, 1877.)
 On Acetylamidophenols by Reduction of Ortho- and Paranitrophenols by means of Glacial Acetic Acid and Tin. (*Notes from Chem. Lab., J. H. U.*, 1877.)
 On the Determination of Barium as Chromate. (*Am. Chem. Jour.*, 1880.)
 Determinations of Chromium in Chrome Iron Ore. (With W. C. Day; *Am. Chem. Jour.*, 1881.)

14. WALTER HINES PAGE, Cary, N. C.

From Cary, N. C.; Randolph-Macon, Va., 1876; Assistant Professor of Greek and English in Randolph-Macon College, 1875-76; Lecturer to the N. C. Normal College, 1878; Professor in Louisville (Ky.) Male High School, 1878-79; (*Greek*, 1876-78.)

An Old Southern Borough. (*Atlantic Monthly*, May, 1881.)

The Southern Educational Problem. (*International Review*, October, 1881.)

15. P. PORTER POINIER.

From Newark, N. J.; M. E., Stevens Inst. of Technology, 1874; (*Physics*, 1876; *died without entering upon the Fellowship*, June, 1876, aged 23 years.)

Formulae for the Apparent Specific Heat of Saturated Vapors. (*Jour. of Franklin Inst.*, 1875.)

16. ERASMUS DARWIN PRESTON; U. S. Coast and Geodetic Survey, now stationed in Baltimore.

From Spruce Grove, Pa.; B. C. E., Cornell, 1875, and C. E., 1880; Assistant Engineer, Cornell University Hydraulic Works, 1875; Instructor in Cornell University, 1875-76; Student at the Ecole des Ponts et Chaussées, Paris, 1878-79; (*Engineering*, 1876-78.)

17. HENRY JOSEPH RICE, Professor of Natural Sciences at Michigan Military Academy, Orchard Lake, Michigan.

From Cazenovia, N. Y.; B. S., Cornell, 1876, and M. S., 1880; Sc. D., Syracuse, 1881; Student of Biology, University of France, Paris, 1878; Assistant U. S. Fish Commission, 1879; (*Biology*, 1876-78.)

Observations upon the Hatching, Variation, and Development of the Raritan River Smelt, *Osmerus eperlanus*. (*Md. Fish Commission*, 1878.)

Notes upon the Development of the Shad, *Alosa sapidissima*. (*Md. Fish Commission*, 1878.)

Observations upon the Habits, Structure and Development of *Amphioxus lanceolatus*. (*Am. Nat.*, 1880; *trans. in Journal de Micrographie*, Paris, 1880.)

18. JOSIAH ROYCE, Ph. D., Instructor in English Literature at the University of California.

From Oakland, Cal.; A. B., University of California, 1875; Ph. D., Johns Hopkins, 1878; (*Philosophy*, 1876-78.)

Interdependence of the Principles of Human Knowledge. (*Graduating Thesis*, J. H. U., 1878.)

Schiller's Ethical Studies. (*Jour. of Spec. Philos.*, 1878.)

Shelley and the Revolution. (*Californian*, 1880.)

Nature of Voluntary Progress. (*Berkeley Quarterly*, 1880.)

Before and Since Kant. (*Berkeley Quarterly*, April, 1881.)

George Elliot as a Religious Teacher. (*Californian*, April, 1881.)

"Mind-stuff" and Reality. (*Mind*, July, 1881.)

Pessimism and Modern Thought. (*Berkeley Quarterly*, October, 1881.)

Primer of Logical Analysis for Composition Students. (*San Francisco, Bancroft*, 1881.)

Mind and Reality. (*Mind*, 1882.)

The Decay of Earnestness. (*Californian*, 1881.)

Doubting and Working. (*Californian*, 1881.)

How Beliefs are Made. (*Californian*, 1882.)

Kant's Relation to Modern Philosophic Progress. (*Jour. of Spec. Philos.*, Oct., 1881.)

19. ERNEST GOTTLIEB SIHLER, Ph. D., Classical Instructor, New York City.

From Fort Wayne, Ind.; Concordia College [German Gymnasium, Fort Wayne], 1869; Student of Classical Philology at Berlin and Leipsic, 1872-75; Ph. D., Johns Hopkins, 1878; (*Greek*, 1876-79.)

Plato's Use of Metaphor and Comparison. (*Graduating Thesis*, J. H. U., 1878.)
Herodotus, Æschylus, and the Battle of Salamis. (*Trans., Am. Philol. Assoc.*, 1877.)
The Rhetorical and Critical Labors of Dionysius of Halicarnassus. (*Proc., Am. Philol. Assoc.*, 1879.)
Character and Career of Tiberius. (*Penn Monthly*, 1880.)
Virgil and Plato. (*Trans., Am. Philol. Assoc.*, 1880.)
Plato: Protagoras. Edited with an introduction and notes. (*New York, Harper*, 1881.)
The Use of Abstract Verbal Nouns in -*sis* in Thucydides. (*Trans., Am. Philol. Assoc.*, 1881.)
Homer and Strabo. (*Proc., Am. Philol. Assoc.*, 1881.)

20. FREDERICK BOYD VAN VORST, Attorney at Law, New York City.

From New York City; A. B., Princeton, 1875; Fellow in Metaphysics in Princeton College, 1875-76; (*Ethics and Metaphysics*, 1876-77.)

21. JOHN HENRY WHEELER, Ph. D., Professor of Latin at Bowdoin College.

From Woburn, Mass.; A. B., Harvard, 1871, and A. M., 1875; Fellow of Harvard University, 1877-80; Ph. D., Bonn, 1879; Tutor in Greek and Latin at Harvard University, 1880-81; (*Philology*, 1876-77.)
De Alcestidis et Hippolyti Euripidearum Interpolationibus. (*Inaugural Dissertation*, Bonn, 1879.)

22. SAMUEL FESSENDEN CLARKE, Ph. D., Professor of Natural History at Williams College.

From Geneva, Ill.; Assistant Zoölogist U. S. Fish Commission, 1874-75; Assistant in Zoölogy in Sheffield Scientific School, 1874-76; Ph. B., Yale, 1878; Ph. D., Johns Hopkins, 1879; Assistant in the Biological Laboratory, 1879-80; (*Biology*, 1876-79.)

New and Rare Species of Hydroids from the New England Coast. (*Conn. Acad.*, 1875.)
New Hydroids of the Pacific Coast, South of Vancouver Island. (*Conn. Acad.*, 1876.)
Hydroids of Alaska. (*Acad. Nat. Sc., Phila.*, 1876; *Smithsonian Institution*, 1876.)
Hydroids of the Gulf Stream and Gulf of Mexico. (*Mus. Comp. Zool., Camb., Mass.*, 1879.)
Development of Amblystoma punctatum, Baird. (*Graduating Thesis*, J. H. U., 1879; *Studies from the Biol. Lab., J. H. U.*, 1879.)
Development of a Double-headed Vertebrate. (*Boston Soc. Nat. Hist.*, 1880.)
The Early Development of the Wolfian Body in Amblystoma punctatum. (*Studies from the Biol. Lab., J. H. U.*, 1881.)
New Hydroids from Chesapeake Bay. (*Boston Soc. Nat. Hist.*, 1882.)

23. LYMAN BEECHER HALL, Ph. D., Professor of Chemistry and Physics at Haverford College, Montgomery County, Pa.

From New Bedford, Mass.; Phillips Academy, Andover, Mass., 1869; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; Assistant in Chemical Laboratory, 1879-80; (*Chemistry*, 1877-79.)

Ueber Orthonitrosalicylsäure und einige Abkömmlinge derselben. (*Inaugural Dissertation*, Göttingen, 1875.)
On the Oxidation of Mesitylene-Sulphonic Acid. (*Notes from Chem. Lab., J. H. U.*, 1877; *Ber. d. deut. chem. Ges.*, X.)
On the Oxidation of Substitution Products of Mesitylene. (*Notes from Chem. Lab., J. H. U.*, 1878.)
Ueber Oxidationsprodukte aus Cymosulfamid. (*Ber. d. deut. chem. Ges.*, XII.)
On the Oxidation of Substitution Products of Aromatic Hydrocarbons. (With Professor Reinsen; *Am. Chem. Jour.*, 1880.)

24. ALEXANDER DUNCAN SAVAGE, New York City.

From Pass Christian, Miss.; B. Litt., University of Virginia, 1870; First Assistant Director of the Metropolitan Museum of Art, New York, 1879-81; (*Greek*, 1876-79.)

The "Oath of Rhadamanthus." (*Proc., Am. Philol. Assoc.*, 1878.)

Potteries of the Cesnola Collection. (*Metropolitan Museum of Art, Handbook No. 2, New York*, 1880.)

Sculptures of the Cesnola Collection of Cypriote Antiquities. (*Metropolitan Museum of Art, Handbook No. 3, New York*, 1880.)

A Short Guide to the Cesnola Collection of Cypriote Antiquities. (*Metropolitan Museum of Art, New York*, 1880.)

25. FABIAN FRANKLIN, Ph. D., Assistant in Mathematics.

From Baltimore; Ph. B., Columbian University, 1869; Engineer Corps, Pittsburg and Connellsville Railroad, 1870-71; City Surveyor's Office, Baltimore, 1871-77; Graduate Student of Mathematics, 1876-77; Ph. D., Johns Hopkins, 1880; (*Mathematics*, 1877-79.)

Bipunctual Coördinates. (*Graduating Thesis, J. H. U.*, 1880; *Am. Jour. of Math.*, 1878.)

Notes on Partitions of Numbers, etc. (*Am. Jour. of Math.*, 1878; 1879; 1880.)

On the Calculation of the Generating Functions and Tables of Groundforms for Binary Quantics. (*Am. Jour. of Math.*, 1880.)

Sur le Développement du Produit Infini $(1-z)(1-z^2)(1-z^3)(1-z^4)\dots$ (*Comptes Rendus*, XCII, p. 448, 1880.)

26. CHRISTIAN SIHLER, Ph. D., Physician, Cleveland, Ohio.

From Fort Wayne, Ind.; Concordia, 1866; M. D., University of Michigan, 1871; Assistant in the Biological Laboratory, 1879-80; Ph. D., Johns Hopkins, 1881; (*Biology*, 1877-79.)

On the so-called Heat-Dyspnoea. (*Jour. of Physiol.*, 1879.)

Some Further Observations on Heat-Dyspnoea. (*Jour. of Physiol.*, 1880; *Studies from the Biol. Lab., J. H. U.*, 1881.)

Notes on the Formation of Dentine and of Osseous Tissue. (*Graduating Thesis, J. H. U.*, 1881; *Studies from the Biol. Lab., J. H. U.*, 1881.)

27. FRANCIS GREENLEAF ALLINSON, Ph. D., Assistant Professor of Greek and Latin at Haverford College.

From Burlington, N. J.; A. B., Haverford, 1876, and A. M., 1879; A. B., Harvard, 1877; Temporary Instructor in Greek at Haverford College, 1878; Ph. D., Johns Hopkins, 1880; (*Greek and Sanskrit*, 1877-80.)

On Ionic Forms in the Second Century, A. D., and the obligations of Lucian to Herodotus. (*Graduating Thesis, J. H. U.*, 1880.)

Attributive Positions of the Possessive Pronoun in Herodotus, Lysias, Isocrates, and Demosthenes. (*Quaker Alumnus, Phila.*, 1878.)

A Proposed Redistribution of Parts in the Parodos of the Vespae of Aristophanes. (*Am. Jour. of Philol.*, 1880.)

28. MAURICE BLOOMFIELD, Ph. D., Associate in Sanskrit.

From Chicago, Ill.; A. M., Furman University, (S. C.), 1877; Ph. D., Johns Hopkins, 1879; Student of Philology at Berlin and Leipsic, 1879-81; (*Sanskrit and Greek*, 1878-79.)

Noun-Formation of Rig-Veda. (*Graduating Thesis, J. H. U.*, 1879.)

The Ablaut of Greek Roots which show Variation between *E* and *O*. (*Am. Jour. of Philol.*, 1880.)

Das Grhyasamgrahapariçīṣṭa des Gobhila-putra, (*Zeitsch. d. deut. morgenl. Ges.*, Vol. XXXV.)

On Diphthongal *E* and *O* in Sanskrit. (*Am. Oriental Soc., Proc.*, 1881.)

Final *As* before Sonants in Sanskrit. (*Am. Jour. of Philol.*, 1882.)

29. CONSTANTINE FAHLBERG, Ph. D., Chemist, Gray's Ferry Chemical Works, Philadelphia.

From Tambow, Russia; Ph. D., Leipsic, 1873; Director of the United Brunswick-Hanover Metallurgical Laboratory, Oker, Harz-Mountains, 1874-75; Analytical and Consulting Chemist, New York City, 1875-76; Assistant in Dr. Halse's Technological Laboratory, London, 1876-77; Chemist of the Colonial Company, London and Demerara (South America), 1877-78; Graduate Student of Chemistry, 1878; (*Chemistry*, 1878-80.)

Determination of Calcium Monosulphide in Boneblack. (*Zeitsch. f. analyt. Chem.*, 1871.)
On Oxyacetic Acid. (*Dissertation, Leipsic*, 1873, *Kolbe's Jour.*, 1873.)

New Method for the Volumetric Estimation of Zinc. (*Zeitsch. f. analyt. Chem.*, 1875.)

Description of the Manufacture of Cane Sugar in Demerara. (*Royal Gazette*, 1877.)
Method for the Manufacture of Zinc Carbonate from Zinc Sulphate. (*U. S. Patent Office*, 1878.)

A New Method for the Quantitative Estimation of Sulphur. (*Notes from Chem. Lab., J. H. U.*, 1878.)

On the Oxidation of Tolueneorthosulphamide. (With Prof. Remsen; *Ber. d. deut. chem. Ges.*, 1878; *Am. Chem. Jour.*, 1880.)

On the Liquid Toluenesulphochloride. (*Am. Chem. Jour.*, 1879.)

Reply to Delachanal and Mermet. (*Ber. d. deut. chem. Ges.*, 1879.)

On Toluenedisulphonic Acid and its Derivatives. (*Am. Chem. Jour.*, 1880.)

30. EDWIN HERBERT HALL, Ph. D., Instructor in Physics at Harvard University.

From Gorham, Maine; A. B., Bowdoin, 1875; Graduate Student of Physics, 1877-78; Ph. D., Johns Hopkins, 1880; Assistant in Physical Laboratory, 1880-81; (*Physics*, 1878-80.)

On a New Action of the Magnet on Electric Currents. (*Am. Jour. of Math.*, 1879.)

On Boltzmann's Method of Determining the Velocity of an Electric Current. (*Am. Jour. of Science*, 1880.)

On the New Action of Magnetism on a Permanent Electric Current. (*Graduating Thesis, J. H. U.*, 1880; *Am. Jour. of Science*, 1880.)

The "Rotational Coefficient" in Nickel and Cobalt. (*Phil. Mag.*, Sept., 1881.)

31. EDWARD COLES HARDING, Lottsburg, Va.

From Northumberland County, Va.; A. M., University of Virginia, 1876; Law Department, University of Virginia, 1876-77; Classical Instructor, Baltimore, 1877-78; Professor of Greek, University of Louisiana, 1879-80; Classical Instructor. New York, 1880-81; (*Greek*, 1878-79.)

32. ISAAC OTT, Physician, Easton, Pa.

From Easton, Pa.; M. D., University of Pennsylvania, 1869; Resident Physician in St. Mary's Hospital, Philadelphia, 1870; Lecturer on Experimental Physiology in the University of Pennsylvania, 1876-77; A. M., Lafayette, 1877; Associate Editor, Journal of Nervous and Mental Diseases; (*Biology*, 1878-79.)

Cocain, Veratria, and Gelsemium. (*Phila.*, 1874.)

Rapidity of Transmission of Nerve Force in Normal and Stretched Nerves. Extra Polar Katelectrotonus. (*Jour. of Nervous and Mental Diseases*.)

The Action of Medicine. (*Phila., Lindsay*, 1868.)

Sweat-Centres: The Action of Muscarin and Atropin on them. (*Jour. of Physiol.*, 1878.)
Observations on the Spinal Cord. (*Studies from the Biol. Lab., J. H. U.*, 1880; *Jour. of Physiol.*, 1879.)

Contributions to Physiology and Pathology of Nervous System, I, II, III. (*Phila.*, 1879-81.)
Also a large number of minor contributions to *Phila. Med. Times*, *Boston Med. Journal*; *Jour. of Nerv. and Ment. Diseases*, etc.

33. HENRY SEWALL, Ph. D., Associate in Biology.

From Baltimore; S. B., Wesleyan, 1876; Graduate Student of Biology, and Assistant in Laboratory, 1876-78; Ph. D., Johns Hopkins, 1879; Student of Biology at Cambridge, Leipsic, and Heidelberg, 1879-80; (*Biology*, 1878-79) Development and Regeneration of Gastric Glandular Epithelium during Fœtal Life and after Birth. (*Graduating Thesis*, *J. H. U.*, 1879; *Jour. of Physiol.*, 1878.) On the Effect of Two Succeeding Stimuli upon Muscular Contraction. (*Jour. of Physiol.*, 1879.) On the Changes in Pepsin-forming Glands during Secretion. (With J. N. Langley; *Jour. of Physiol.*, 1879.) Zur Physiologie des Sehepithels, insbesondere der Fische. (With W. Kühne; *Untersuch., a. d. Physiol. Inst. z. Heidelberg*, 1880.) A Note on the Processes Concerned in the Secretion of the Pepsin-forming Glands of the Frog. (*Studies from the Biol. Lab., J. H. U.*, 1881.) On the Polar Influences upon Nerves of very weak Induction Currents. (*Jour. of Physiol.*, 1882.) Ueber die Summirung untermaximaler Reize in Muskeln. (With J. v. Kries, *Aus dem physiol. Inst. zu Leipzig; Archiv f. Anat. u. Physiol.*, 1881.)

34. WASHINGTON IRVING STRINGHAM, Ph. D., Parker Fellow of Harvard University, and Student of Philosophy in the University of Leipsic.

From Topeka, Kansas; A. B., Harvard, 1877; Graduate Student of Mathematics, 1877-78; Ph. D., Johns Hopkins, 1880; (*Mathematics*, 1878-80.) Investigations in Quaternions. (*Proc. Am. Acad.*, 1878.) Some General Formulæ for Integrals of Irrational Functions. (*Am. Jour. of Math.*, 1879.) The Quaternion Formulæ for Quantification and for Barycentres. (*Am. Jour. of Math.*, 1879.) Regular Figures in n -Dimensional Space. (*Graduating Thesis*, *J. H. U.*, 1880; *Am. Jour. of Math.*, 1880.)

35. ABRAM VAN EPPS YOUNG, Student of Chemistry at Harvard University.

From Grand Rapids, Mich.; Ph. B., University of Michigan, 1875; Assistant in Chemistry and Physics in the University of Michigan, 1875-77; Graduate Student of Chemistry, 1877-78, 1881-82; (*Chemistry*, 1878-80.) An Apparatus for Gas Analysis from Simple Laboratory Material. (*Am. Chem. Jour.*, 1879.)

36. CHARLES ROBERT HEMPHILL, Professor of Ancient Languages at the Southwestern Presbyterian University, Clarksville, Tenn.

From Chester, S. C.; University of South Carolina, 1869; University of Virginia, 1871; Southern Presbyterian Theological Seminary, 1874, and Tutor in Hebrew in same, 1874-78; A. M., Davidson, 1878; (*Greek*, 1878-79.)

37. ALLAN MARQUAND, Ph. D., Lecturer on Modern Logic and Tutor in Latin at Princeton College.

From New York City; St. Paul's School, Concord, N. H., 1871; A. B., Princeton, 1874; Tutor in Princeton College, 1876; Union Theological Seminary, New York, 1877; Student at Berlin, 1877-78; Ph. D., Johns Hopkins, 1880; (*Logic and Ethics*, 1877-80.)

The Logic of the Epicureans,—with a translation of a treatise of Philodemus—*περί σημειων και σημειωσεων*. (*Graduating Thesis*, *J. H. U.*, 1880.) On Logical Diagrams for n -Terms. (*Phil. Mag.*, October, 1881.)

38. CHARLES AMBROSE VAN VELZER, Assistant Professor of Mathematics at the University of Wisconsin.

From Ithaca, N. Y.; S. B., Cornell, 1876; Instructor in Mathematics at Cornell University, 1876-77; (*Mathematics*, 1878-81.)

39. BROWN AYRES, Professor of Physics at the University of Louisiana, New Orleans.

From New Orleans, La.; S. B., Stevens Inst. of Technology, 1878; Graduate Student of Mathematics and Physics, 1878-79; (*Physics*, 1879-80.)

The Gramme Machine. (*Sc. Amer. Supp.*, 1876.)

The Telephone. (*Jour. of Franklin Inst.*, 1878.)

New Arrangement for Telephone. (*Sc. Amer. Supp.*, 1878.)

Two New Forms of Bell Telephone. (*Jour. of Franklin Inst.*, 1878.)

40. LOUIS BEVIER, Ph. D., Student of Philology at the University of Bonn.

From Marblatown, N. Y.; A. B., Rutgers, 1878; Graduate Student of Greek, 1878-79; Ph. D., Johns Hopkins, 1881; (*Greek*, 1879-81.)

On the Genuineness of the First Antiphoncean Oration. (*Graduating Thesis*, *J. H. U.*, 1881.)

41. EDWARD MUSSEY HARTWELL, Ph. D., Cincinnati, Ohio.

From Littleton, Mass.; Public Latin School, Boston, 1869; A. B., Amherst, 1873, and A. M., 1876; Vice Principal of High School, Orange, N. J., 1873-74; Instructor in Latin School, Boston, 1874-77; Student in Miami Medical College, 1877-78; Graduate Student of Biology and Chemistry, 1878-79; Ph. D., Johns Hopkins, 1881; M. D., Miami Medical College, 1882; (*Biology*, 1879-81.)

The Function of the Internal Intercostal Muscles. (With Prof. H. N. Martin; *Jour. of Physiol.*, 1879.)

The Legal Status of Anatomical Science. (*Jour. of Social Science*, 1880.)

American Anatomy Acts, five articles. (*Boston Med. and Surg. Jour.*, 1880.)

The Earliest English and American Medical Acts. (*Boston Med. and Surg. Jour.*, 1880.)

European and American Anatomy Acts Compared, two articles. (*Boston Med. and Surg. Jour.*, 1881.)

The Study of Human Anatomy Historically and Legally Considered. (*Studies from the Biol. Lab.*, *J. H. U.*, 1881.)

The Hindrances to Anatomical Study in the United States, including a Special Record of the Struggles of Our Early Anatomical Teachers, three articles. (*Annals of Anat. and Surg.*, 1881.)

Notes on some points in the Anatomy and Physiology of the Slider Terrapin, *Pseudemys rugosa*. (*Graduating Thesis*, *J. H. U.*, 1881.)

42. JOHN ROBIN MODANIEL IRBY, Ph. D.

From Lynchburg, Va.; Miller Scholar of University of Virginia, 1873-75; S. B., University of Virginia, 1875; Ph. D., Göttingen, 1878; (*Mineralogy*, 1879-80.) *Died March 25, 1880.*

Eine kritische Untersuchung ueber die bei dem Kalkspath vorkommenden Skalenoeeder, (Prize Essay of the University of Bonn, 1877, expanded and published under the title, On the Crystallography of Calcite, Bonn, 1878; *Groth's Zeitschrift*, *Bd. III.*)

Some Observations on the Crystalline State of Matter. (*Bull., Philos. Soc. of Washington*, 1879; *Smithsonian Misc. Coll.*, vol. XX.)

43. MITSURU KUHARA, Ph. D., University of Tokio, Japan.

From Tsuyama, Japan; Assistant in Chemical Laboratory in University of Tokio, 1878-79; S. B., University of Tokio, 1877; Ph. D., Johns Hopkins, 1881; (*Chemistry*, 1879-81.)

On the Red Colouring Matter of the Lithospermum erythrorhizon. (*Jour. of Chem. Soc. London*, 1879.)

A Method of Estimating Bismuth Volumetrically. (*Am. Chem. Jour.*, 1879.)

Concerning Phthalimide. (*Am. Chem. Jour.*, 1881.)

On the Conduct of Nitro-Meta-Xylene towards Oxidizing Agents. (*Graduating Thesis*, *J. H. U.*, 1881; with Prof. Remsen, *Am. Chem. Jour.*, 1882.)

44. OSCAR HOWARD MITCHELL.

From Marietta, Ohio; A. B., Marietta, 1875, and A. M., 1878; Principal of High School at Marietta, 1875-78; Graduate Student of Mathematics, 1878-79; (*Mathematics*, 1879-82.)

On Binominal Congruences: Comprising an Extension of Fermat's and Wilson's Theorems and a Theorem of which both are Special Cases. (*Amer. Jour. of Math.*, 1881.)
Some Theorems in Numbers. (*Amer. Jour. of Math.*, 1881.)

45. EDWARD LEAMINGTON NICHOLS, Ph. D., Professor of Physics and Chemistry at Central University, Richmond, Ky.

From Peekskill, N. Y.; S. B., Cornell, 1875; Student of Physics at Leipsic, Berlin, and Göttingen, 1875-79; Ph. D., Göttingen, 1879; Physicist, Edison's Laboratory, Menlo Park, N. J., 1880-81; (*Physics*, 1879-80.)

Ueber die Volumenvermehrung der Flüssigkeiten durch Absorption von Gasen. (*Pogg. Annalen*, 1878, N. F., Bd. 3.)

Ueber das von glühendem Platin ausgestrahlte Licht. (*Inaugural Dissertation, Göttingen*, 1879.)

On the Color of the Sky. (*Philos. Mag.*, 1879.)

On the Character and Intensity of the Rays emitted by glowing Platinum. (*Am. Jour. of Science*, 1879.)

On the Measurement of High Temperatures. (*Am. Jour. of Science*, 1880.)

Salt Solutions and the Absorption of Gases. (*Proc. Am. Assoc.*, 1880.)

On the Co-efficient of Expansion of Gas Solutions. (With A. W. Wheeler; *Am. Assoc.*, Boston, 1880; *Philos. Mag.*, Feb., 1881.)

Note on the Electrical Resistance and the Co-efficient of Expansion of Incandescent Platinum. (*Amer. Assoc. Cincinnati*, 1881; *Am. Jour. of Science*, Nov., 1881.)

Electric Absorption of Crystals. (With Prof. Rowland; *Physical Soc., London*; *Philos. Mag.*, June, 1881.)

46. WALDO SELDEN PRATT, Assistant Director of the Metropolitan Museum of Art, New York City.

From Williamstown, Mass.; Phillips Academy, Andover, Mass., 1874; A. B., Williams, 1878, and A. M., 1881; Graduate Student of Greek and Archæology, 1878-79; (*Aesthetics and the History of Art*, 1879-80.)

Two Essays on the Columnar Architecture of the Egyptians. (*Proc. Am. Acad.*, 1880.)

The Origin and Development of Musical Scales. (*Princeton Review*, Nov., 1881.)

The Church Organist. (*New Englander*, Nov., 1881.)

47. WILLIAM THOMPSON SEDGWICK, Ph. D., Associate in Biology.

From Farmington, Conn.; Ph. B., Yale, 1877; Student in Yale Medical School, 1877-78; Instructor in Physiological Chemistry and Toxicology in Sheffield Scientific School, 1878-79; Assistant in Biological Laboratory, 1880-81; (*Biology*, 1879-80.)

The Influence of Quinine upon the Reflex-excitability of the Spinal Cord. (*Jour. of Physiol.*, 1880; *Studies from the Biol. Lab., J. H. U.*, 1881; *Graduating Thesis, J. H. U.*, 1881.)
Observations on the Mean Pressure and the Characters of the Pulse-Wave in the Coronary Arteries of the Heart. (With Prof. Martin; *Jour. of Physiol.*, Jan., 1882; abstract printed in *Transactions, Medical and Chirurgical Faculty of Maryland*, 1881, and in *Studies from the Biol. Lab., J. H. U.*, 1882.)

48. HERMAN VOORHEES.

From Troy, N. Y.; C. E., Rensselaer Polytechnic Inst., 1873; Graduate Student of Chemistry, 1878-79; (*Chemistry*, 1879; died October 14, 1879, without entering on the Fellowship, aged 27 years.)

49. CHARLES OTIS WHITMAN, Ph. D., Leipsic, Germany.

From Newton Highlands, Mass.; A. B., Bowdoin, 1868, and A. M., 1871; Ph. D., Leipsic, 1878; Professor of Zoölogy at the University of Tokio, Japan, 1879-81. (*Biology*, 1879; *did not enter upon the Fellowship*.)

The Embryology of Clepsine. (*Quart. Jour. of Micros. Science*, 1878)

50. EDMUND BEECHER WILSON, Ph. D., Assistant in the Biological Laboratory.

From Geneva, Ill.; Ph. B., Yale, 1878; Assistant in Zoölogy at Yale College, 1877-79; Ph. D., Johns Hopkins, 1881; (*Biology*, 1879-81.)

Description of Two New Genera of Pycnogonida. (*Am. Jour. of Science*, 1878.)

The Pycnogonida of New England and Adjacent Waters. (*U. S. Fish Comm., Report*, 1877.)

A Synopsis of the Pycnogonida of New England. (*Conn. Acad.*, 1878.)

The Early Stages of *Renilla*. (*Am. Jour. of Science*, 1880.)

Origin and Significance of the Metamorphosis of *Actinotrocha*. (*Quar. Jour. of Micros. Science*, April, 1881, 2 plates; abstract in *Am. Nat.*, 1882.)

Report on the Pycnogonida. (*Bull. Mus. Comp. Zool., Cambridge*, Vol. VIII, No. 12, 5 plates.)

The First Zœa of Porcellana. (With W. K. Brooks; *Studies from the Biol. Lab., J. H. U.*, 1881, 2 plates.)

Observations on the Early Developmental Stages of some Polychæteous Annelides. (*Studies from the Biol. Lab., J. H. U.*, 1882; abstract in *Zool. Anzeiger*, 1880, and in *Am. Jour. of Science*, 1880.)

51. GEORGE FREDERICK NICOLASSEN, Assistant in Greek and Latin.

From Baltimore; A. B., University of Virginia, 1879, and A. M., 1880; (*Greek*, 1879-81.)

52. WILLIAM BURNET, Ph. D., Professor of Chemistry at the South Carolina Agricultural College, Columbia.

From Davidson College, N. C.; S. B., Davidson, 1875; Student of Chemistry at Leipsic, Heidelberg, and Paris, 1875-79; Ph. D., Heidelberg, 1879; (*Chemistry*, 1879-80.)

On Erbium and Yttrium. (*Jour. of Chem. Soc., London*, 1879)

Sulphoterephthalic Acid. (With Prof. Remsen; *Am. Chem. Jour.*, 1881.)

53. ROBERT WOODWORTH PRENTISS, Office of U. S. Nautical Almanac, Washington, D. C.

From New Brunswick, N. J.; S. B., Rutgers, 1878; Graduate Student of Mathematics, 1878-79; (*Mathematics*, 1879-81.)

54. JAMES WILSON BRIGHT.

From Lock Haven, Pa.; A. B., Lafayette, 1877, and A. M., 1880; Graduate Student of Teutonic Languages, 1879-80; (*Teutonic Languages*, 1880-82.)

55. BENJAMIN CHAPMAN BURT, Assistant Professor of English and Rhetoric at the University of Michigan.

From Ann Arbor, Michigan; A. B., University of Michigan, 1875, and A. M., 1879; Professor of English Literature in Indiana State Normal School, 1875-78; Graduate Student of Philosophy, 1879-80; (*Philosophy*, 1880-81.)

Shakespeare and the Seventeenth Century. (*New Englander*, May, 1881.)

Kant and the Present. (*Unity*, June, 1881.)

56. SPENCER HEDDEN FREEMAN.

From Mumford, N. Y.; A. B., Rochester, 1875; and A. M., 1878; Teacher of Physical Science, Le Roy Academy, N. Y., 1875-76; Instructor in Mathematics and Physics, Denison University, 1876-78; Graduate Student of Physics and Mathematics, 1879-80; (*Physics*, 1880-82.)

57. KAKIOCHI MITSUKURI, Lecturer on Zoölogy at the University of Tokio, Japan.

From Tokio, Japan; Ph. B., Yale, 1879; Graduate Student of Biology, 1879-80; (*Biology*, 1880-81.)

Recent Changes in Japan. (*International Review*, May, 1881.)
On the Structure and Significance of some Aberrant Forms of Lamellibranchiate Gills. (*Quart. Jour. Micros. Sci.*, July, 1881; *Studies from the Biol. Lab.*, J. H. U., 1882.)
On the Development of the Suprarenal Bodies in Mammalia. (*Quart. Jour. of Micros. Sci.*, Jan., 1882.)

58. BERNARD FRANCIS O'CONNOR.

From Paris, France; Bach. ès lettres, Université de France, 1874; Graduate Student of Romance Languages, 1879-80; (*Romance Languages*, 1880-82.)

French Verbs in *eler* and *eler*. (*Am. Jour. of Philol.*, 1880.)
Negative Particle *nie* in Old French. (*Am. Jour. of Philol.*, 1881.)

59. CHASE PALMER.

From Baltimore; Matriculated Student, 1876-79, A. B., 1879, and Graduate Student, 1879-80; (*Chemistry*, 1880-82.)

On the Oxidation of Metatoluene Sulphamide. (With Prof. Remsen; *Am. Chem. Jour.*, 1882; *in press*.)

60. HERBERT MILLS PERRY.

From New Ipswich, N. H.; Appleton Academy, N. H., 1868-71; Phillips Academy, Exeter, N. H., 1876; A. B., Harvard, 1880; (*Mathematics*, 1880-82.)

61. WILLIAM LEE ROWLAND, Philadelphia.

From Springfield, Mass.; Springfield High School; Massachusetts Inst. of Technology; S. B., University of Pennsylvania, 1878, and Assistant in Chemistry, 1878-80; (*Chemistry*, 1880; *did not enter upon the Fellowship*.)

62. EDWARD HENRY SPIEKER.

From Baltimore; Matriculated Student, 1877-79, A. B., 1879, and Graduate Student, 1879-80; (*Greek*, 1880-82.)

63. MORRISON ISAAC SWIFT.

From Ashtabula, Ohio; Grand River Institute, Ohio, 1874-75; Western Reserve College, 1875-77; Williams College, 1877-79, and A. B., 1879; Graduate Student of Greek and Philosophy, 1879-80; (*Philosophy*, 1880-82.)

64. ARTHUR WILSON WHEELER.

From Rockland, Mass.; A. B., Amherst, 1879; Graduate Student of Physics, 1880; (*Physics*, 1880-81.) *Died January 6, 1881, aged 21 years.*

On the Co-efficient of Expansion of Gas Solutions. (With E. L. Nichols; *Am. Assoc.*, Boston, 1880; *abstract in Science*, 1880.)

65. ROBERT DORSEY COALE, Ph. D., Assistant in Chemical Laboratory.

From Baltimore; C. E., Pennsylvania Military Academy, 1875; Special Student of Chemistry, 1876-80; Ph. D., Johns Hopkins, 1881; (*Chemistry*, 1880-81.)

On Anhydrosulphamineisophthalic Acid. (With Prof. Remsen; *Ber. d. deut. chem. Ges.*, 1879.)

Oxidation of Sulphamine metatoluic Acid in Alkaline and in Acid Solution. (With Prof. Remsen; *Am. Chem. Jour.*, 1881.)

On Sulphamine- and Sulphoisophthalic Acids. (*Graduating Thesis*, J. H. U., 1881.)

66. ANDREAS FRANZ WILHELM SCHIMPER, Ph. D., University of Bonn, Germany.

From Strassburg, Germany; Gymnasium at Strassburg, 1864-1874; Ph. D., Strassburg, 1878; Assistant and Provisional Director in the Museum of Natural History, Strassburg, 1878-80; (*Biology*, 1880-81.)

Blüdt und Glauberit von Vurcha in Pendschab. (*Zeitsch. für Krystallographie*, 1877.)

Untersuchungen über die Proteinkrystalloide der Pflanzen. (*Inaugural Dissertation*, Strassburg, 1878.)

Kupferkies in Groth, "Die Mineraliensammlung der Universität Strassburg." (*Strassburg*, 1879.)

Die Vegetationsorgane von Prosopanche Burmeisteri. (*Abhandl. der naturforsch. Ges. zu Halle*, 1880.)

Die Krystallisation der eiweissartigen Substanzen. (*Zeitsch. für Krystallographie*, 1880.)

Untersuchungen über die Entstehung der Stärkekörner. (*Botanische Zeitung*, 1880.)

Researches upon the Development of Starch Grains. (*Quart. Jour. of Micros. Sci.*, April, 1881; *Studies from the Biol. Lab.*, J. H. U., 1882.)

67. LAWRENCE BUNTING FLETCHER, Ph. D., Assistant in Physics at the University of Pennsylvania.

From New York City; A. B., Columbia, 1877, and A. M., 1880; Fellow in Science, Columbia, 1877-80; Ph. D., Johns Hopkins, 1881; Assistant in Physical Laboratory, 1881; (*Physics*, 1880-81.)

Note on the Relation between the Mechanical Equivalent of Heat and the Ohm. (*Phil. Mag.*, 1881.)

68. WILLIAM JOHN ALEXANDER.

From Hamilton, Ontario; Scholar of the University of Toronto, 1873; Canadian Gilchrist Scholar and Student of University College, London, 1874-77; A. B., University of London, 1876; Graduate Student of Greek, 1879-81; (*Greek*, 1881-82.)

69. EDWARD SANDFORD BURGESS.

From Silver Creek, N. Y.; Fredonia State Normal School, N. Y., 1875; A. B., Hamilton, 1879; Instructor in Greek and Latin at Delaware Literary Institute, Franklin, N. Y., 1879-80; Graduate Student of Greek and Latin, 1880-81; (*Greek*, 1881-82.)

70. WILLIAM JAMES COMSTOCK.

From Toledo, Ohio; Williston Seminary, Easthampton, Mass., 1876; Ph. B., Yale, 1879; Graduate Student at Sheffield Scientific School, 1879-80; Assistant in Chemistry and Instructor in Mineralogy at Sheffield Scientific School, 1880-81; (*Chemistry*, 1881-82.)

Tetrahedrite from Huallanca, Peru. (*Am. Jour. of Science*, 1879.)

Analyses of some American Tantalates. (*Am. Jour. of Science*, 1880.)

On the Chemical Composition of Uraninite from Branchville, Conn. (*Am. Jour. of Science*, 1880.)

Bastnäsïte and Tysonite from Colorado. (With Prof. O. D. Allen; *Am. Jour. of Science*, 1880.)

Analyses of Onofrite from Utah. (*Am. Jour. of Science; Zeitsch. für Krystallographie*, 1881.)

71. WILLIAM CATHCART DAY.

From Baltimore; Matriculated Student, 1877-80, A. B., 1880, and Graduate Student, 1880-81; (*Chemistry*, 1881-82.)

Determinations of Chromium in Chrome Iron Ore. (With H. N. Morse; *Am. Chem. Jour.*, 1881.)

72. HENRY HERBERT DONALDSON.

From New York City; Phillips Academy, Andover, 1875; A. B., Yale, 1879; Student in Chemistry, Sheffield Scientific School, 1879-80; College of Physicians and Surgeons, N. Y., 1880-81; (*Biology*, 1881-82.)

73. WILLIAM PITT DURFEE.

From Berkeley, Cal.; A. B., University of Michigan, 1876; Instructor in Mathematics, Berkeley, Cal., 1877-81; Graduate Student of Mathematics, 1881; (*Mathematics*, 1881-82.)

Tables of Symmetric Functions of the Roots of the Twelfthic. (*Am. Jour. of Math.*, 1882.)

74. GEORGE STETSON ELY.

From Fredonia, N. Y.; A. B., Amherst, 1878; Instructor in Mathematics, University of Michigan, 1880-81; (*Mathematics*, 1881-82.)

75. JOHN FRANKLIN JAMESON.

From Amherst, Mass.; A. B., Amherst, 1879; Instructor in the Worcester (Mass.) High School, 1879-80; Graduate Student of History, 1880-81; (*History*, 1881-82.)

76. CHARLES HERSCHEL KOYL.

From Cobourg, Ontario; A. B., Victoria University, Ont., 1877; Science Master at Wesleyan College, Stanstead, Quebec, 1877-79; Graduate Student of Physics, 1879-81; (*Physics*, 1881-82.)

The Colors of Thin Blow-pipe Deposits. (*Am. Jour. of Science, Sept.*, 1880; *Phil. Mag.*, Oct., 1880.)

77. HENRY LESLIE OSBORN.

From Madison, N. J.; A. B., Wesleyan University, 1878; Assistant in Natural History, Wesleyan University, 1878-81; (*Biology*, 1881-82.)

78. HENRY NEWLIN STOKES.

From Moorestown, N. J.; S. B., Haverford, 1878; Graduate Student of Chemistry, 1878-81; (*Biology*, 1881-82.)

79. BENJAMIN W. WELLS, Ph. D., Instructor in English at the Friends' School, Providence, R. I.

From Boston, Mass.; A. B., Harvard, 1877, and Ph. D., 1880; (*English*, 1881; *did not enter upon the Fellowship*.)

History of the α -Vowel, from Old Germanic to Modern English. (*Trans. Am. Philol. Assoc.*, 1881.)

80. BENJAMIN IVES GILMAN.

From New York City; A. B., Williams, 1872, and A. M., 1880; Graduate Student of Logic, 1879-81; (*Logic*, 1881-82.)

C.
Degrees Conferred.

HONORARY.

1880.

HENRY A. ROWLAND, PH. D.
Professor of Physics.

1881.

RUTHERFORD B. HAYES, LL. D.
President of the United States.

1878.

DOCTORS OF PHILOSOPHY.

HENRY CARTER ADAMS. (F).

A. B., Iowa, 1874.—Non-Resident Professor, Cornell University.

THOMAS CRAIG. (F).

C. E., Lafayette, 1875.—Associate, Johns Hopkins University.

JOSIAH ROYCE. (F).

A. B., University of California.—Instructor, University of California.

ERNEST GOTTLIEB SIHLER. (F).

Concordia, 1869.—Classical Instructor, New York City.

(4)

1879.

DOCTORS OF PHILOSOPHY.

MAURICE BLOOMFIELD. (F).

A. M., Furman, 1877.—Associate, Johns Hopkins University.

SAMUEL FESSENDEN CLARKE. (F).

Ph. B., Yale, 1878.—Professor, Williams College.

GEORGE BRUCE HALSTED. (F).

A. B., Princeton, 1875.—Instructor, Princeton College.

EDWARD HART. (F).

S. B., Lafayette, 1874.—Assistant Professor, Lafayette College.

WILLIAM WHITE JACQUES. (F).

S. B., Mass. Inst. of Techn., 1876.—Electrician, Boston, Mass.

HENRY SEWALL. (F).

S. B., Wesleyan, 1876.—Associate, Johns Hopkins University.

(5)

BACHELORS OF ARTS.

GEORGE WASHINGTON MCCREARY.

Baltimore.

CHASE PALMER. (F).

Fellow, Johns Hopkins University.

EDWARD HENRY SPIEKER. (F).

Fellow, Johns Hopkins University.

(3)

*The full academic record of those marked "F," is given in the Roll of Fellows, pp. 28-42.

1880.

DOCTORS OF PHILOSOPHY.

- FRANCIS GREENLEAF ALLINSON.** (F).
A. B., Haverford, 1876; A. B., Harvard, 1877.—Asst. Professor, Haverford College.
- FABIAN FRANKLIN.** (F).
Ph. B., Columbian, 1869.—Assistant, Johns Hopkins University.
- EDWIN HERBERT HALL.** (F).
A. B., Bowdoin, 1873.—Instructor, Harvard University.
- ALLAN MARQUAND.** (F).
A. B., Princeton, 1874.—Instructor, Princeton College.
- WASHINGTON IRVING STRINGHAM.** (F).
A. B., Harvard, 1877.—Fellow, Harvard University.

(5)

BACHELORS OF ARTS.

- THOMAS MILTON BEADENKOFF.**
Graduate Student, Johns Hopkins University.
- ALLEN KERR BOND.**
M. D., University of Maryland, 1882.
- WILLIAM CATHCART DAY.** (F).
Fellow, Johns Hopkins University.
- HENRY LAURENCE GANTT.**
Instructor, McDonogh School.
- EDGAR GOODMAN.**
Attorney at Law, Baltimore.
- CAEL ECKHARDT GRAMMER.**
Va. Theological Seminary.
- ALEXANDER FRIDGE JAMIESON.**
Instructor, New Brunswick, N. J.
- EDMUND ALLEN JARVIS.**
Died, October 15, 1880.
- STEWART BRIAN LINTHICUM.**
Graduate Student, Johns Hopkins University.
- JOHN HANSON LOWE.**
Law Dept., University of Maryland.
- LEIGH CLINTON MORGAN.**
Clergyman, Montgomery County.
- NELSON PALMER.**
Baltimore.
- THOMAS PETTIGREW.**
Creswell, N. C.
- HARRY FIELDING REID.**
Graduate Student, Johns Hopkins University.
- WILTZ RAYMOND STRICKLEN.**
Clergyman, Berkeley Springs, W. Va.
- LEWIS WEBB WILHELM.**
Graduate Scholar, Johns Hopkins University.

(16)

1881.

DOCTORS OF PHILOSOPHY.

- LOUIS BEVIER. (F).
A. B., Rutgers, 1878.—Student of Philology, University of Bonn.
- ROBERT DORSEY COALE. (F).
Assistant, Johns Hopkins University.
- EDWARD ALLEN FAY.
A. B., University of Michigan, 1862.—Professor, National Deaf-Mute College.
- LAWRENCE BUNTING FLETCHER. (F).
A. B., Columbia, 1877.—Assistant, University of Pennsylvania.
- SAMUEL GARNER.
A. B., St. Johns, 1871.—Professor, University of Indiana.
- EDWARD MUSSEY HARTWELL. (F).
A. B., Amherst, 1873.
- WILLIAM THOMPSON SEDGWICK. (F).
Ph. B., Yale, 1877.—Associate, Johns Hopkins University.
- CHRISTIAN SIHLER. (F).
Concordia, 1866.—Physician, Cleveland, Ohio.
- EDMUND BEECHER WILSON. (F).
Ph. B., Yale, 1878.—Assistant, Johns Hopkins University.

(9)

BACHELORS OF ARTS.

- WILLIAM WILSON BADEN.
Law Dept., University of Maryland.
- HENRY JOHNS BOWDOIN.
Law Dept., University of Maryland.
- JOHN WILSON BROWN.
Baltimore.
- DAVID TALBOTT DAY.
Graduate Student, Johns Hopkins University.
- WILLIAM HENRY HOWELL.
Graduate Scholar, Johns Hopkins University.
- JOHN JOHNSON.
Instructor, McDonogh School.
- JAMES EDWARD KEELER.
Assistant, Allegheny (Pa.) Astronomical Observatory.
- EDWIN GEORGE RICHARDSON.
Divinity School, Philadelphia.
- ADONIRAM JUDSON ROBINSON.
Instructor, Relisterstown, Md.
- HENRY ROLANDO.
Medical Dept., University of Maryland.
- LEE SALE.
Student of Law, Louisville, Ky.
- MACTIER WARFIELD.
Graduate Student, Johns Hopkins University.

(12)

TOTAL (1878-81.)

DOCTORS OF PHILOSOPHY,	24.
BACHELORS OF ARTS,	31.

D.

System of Fellowships.

Twenty Fellowships are annually open to competition in this University, each yielding five hundred dollars and exempting the holder from all charges for tuition.

OBJECT OF THE FOUNDATION.

The system of Fellowships was instituted for the purpose of affording to young men of talent from any place, an opportunity to continue their studies in the Johns Hopkins University, while looking forward to positions as professors, teachers, and investigators, or to other literary and scientific vocations. The appointments have not been made as rewards for good work already done, but as aids and incentives to good work in the future; in other words, the Fellowships are not so much honors and prizes bestowed for past achievements, as helps to further progress, and stepping-stones to honorable intellectual careers. They have not been offered to those who are definitely looking forward to the practice of either of the three learned professions (though such persons have not been formally excluded from the competition) but have been bestowed almost exclusively on young men desirous of becoming teachers of science and literature, or proposing to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician, and the minister.

Every candidate is expected to submit his college diploma or other certificate of proficiency from the institution where he has been taught, with recommendations from those who are qualified to speak of his character and attainments. But this is only introductory. He must also submit, orally or in writing, such evidence of his past success in study, and of his plans for the future, together with such examples of his literary or scientific work, as will enable the Professors to judge of his fitness for the post. The examination is indeed in a certain sense competitive; but not with uniform tests, nor by formal questions submitted to the candidates. First, the head of a given department considers, with such counsel as he may command, the applicant's record. The Professors then collectively deliberate on the nominations made by individual members of their body. The list upon which they agree, with the reasons for it, is finally submitted by the President of the University to the Executive Committee, and by them to the Trustees for final registration and appointment. By all these precautions, the highest results which were anticipated have been secured. A company of most promising students has been brought together, and their ability as teachers and scholars has been recognized by the calls they have received to permanent and desirable posts in different parts of the country.

The number of applications for Fellowships has been very large, and it may have happened that some candidates have failed of appointment who were really superior to those selected. But if so, this has resulted from the fact, that a considerable number of applicants have each year forwarded to the University merely testimonials from their instructors without any such examples of their own work as have been mentioned above; and in consequence, the Professors, from want of adequate knowledge, have been compelled to pass over candidates who may have been in the highest degree meritorious.

It is obvious from the nature of the case that Graduate Students residing in Baltimore must have better opportunities than others of making known their powers to the appointing board; but the absence of candidates from Baltimore has been no bar to their appointment, in cases where adequate evidence of their claims has been presented.

REGULATIONS.

1. The application must be made in writing.
2. The candidate must give evidence of a liberal education, such as the diploma of a college of good repute; of decided proclivity towards a special line of study, such as an example of some scientific or literary work already performed; and of upright character, such as a testimonial from some instructor.
3. The value of each Fellowship will be five hundred dollars. In case of resignation, promotion, or other withdrawal from the Fellowship, payments will be made for the time during which the office shall have been actually held.
4. Every holder of a Fellowship will be expected to render some services to the institution as an examiner, to give all his influence for the promotion of scholarship and good order, and in general to co-operate in upholding the efficiency of the University, as circumstances may suggest. He must reside in Baltimore, during the academic year.
5. He will be expected to devote his time to the prosecution of special study (not professional) with the approval of the President, and before the close of the year, to give evidence of progress by the preparation of a thesis, the completion of a research, the delivery of a lecture, or by some other method.
6. He may give instruction, with the approval of the President, by lectures or otherwise, to persons connected with the University,—but he may not engage in teaching elsewhere.
7. He may be re-appointed at the end of the year.
8. The appointments are usually made as follows:
In Mathematics, three; Chemistry, three; Physics, three; Biology, three; Greek, three; other subjects, five.
9. *Applications for the next year should reach the University before May 12, 1882.*

E.

Report of Chesapeake Zoölogical Laboratory. FOR THE FOURTH YEAR.

Summer of 1881, Beaufort, N. C.

To the President of the Johns Hopkins University :

DEAR SIR: In accordance with your request I have the honor to submit the following report of the Fourth Session of the Chesapeake Zoölogical Laboratory.

The Laboratory was opened for work at Beaufort, N. C. on May 1, 1881, and it was closed on Sept. 1, although three members of the party remained there several weeks longer, to complete the researches upon which they were engaged.

The following is a list of the members of the party.

W. K. Brooks, *Director.*
E. B. Wilson, *Assistant.*
S. F. Clarke, *Assistant.*
H. Sewall, *Associate in Biology, J. H. U.*
P. R. Uhler, *Associate in Biology, J. H. U.*
H. J. Rice, *Prof., Natural Science, Mich. M. Acad., Orchard Lake, Mich.*
J. Playfair McMurrich, *Assistant in Biology, Univ. of Toronto, Ont.*
Buel P. Colton, *Teacher of Natural Science, Princeton High School, Princeton, Ill.*
H. Garman, *Assistant, State Lab. Nat. Hist., Normal, Ill.*
Jas. E. Armstrong, *Assist., Nat. Hist., Ill. Indust. Univ., Champaign, Ill.*
W. L. Norris, *Arlington, Ill.*
Fernando Sanford, *Professor, Natural Science, Mount Morris College, Mount Morris, Ill.*

The five last named came to Beaufort to attend the elementary class which was conducted by Dr. Clarke, but all, except the two last, remained at the laboratory and engaged in research after the elementary course was finished, and two of them returned to Baltimore and have spent the year in the Biological laboratory.

For six weeks there were eleven in our party, and as the house we have rented for a laboratory furnishes accommodations for only six, a second house was rented for the summer months.

The selection of a site for a three years' session has enabled us to engage in researches which demand considerable time, and cannot be finished in one season, and although I have a smaller number of finished papers to report than in previous years, this is not due to inactivity, but to the more exhaustive character of our work.

Dr. Wilson has completed his studies of the development of marine annelids, upon which he was engaged during the summer of 1880, and an illustrated paper by him on this subject is now in press, and will appear in a few days. Almost all his time this season has been devoted to the study of the structure and development of *Renilla*, a subject in which

he and Mr. Mitsukuri made a beginning, in 1880, as I have mentioned in a previous report. Great difficulty was found in procuring the very early stages, and it was not until more than six months had been spent in fruitless efforts that he succeeded in obtaining a supply of fertilized eggs, and in rearing the young.

At every stage the research presented great difficulties, and it has occupied almost the entire time of Dr. Wilson for two years, but the work is now nearly completed, and I hope that in a few months his results, which are of very great interest and importance, will be made public.

Dr. Sewall devoted three months to a physiological investigation, the study of the equilibrating function of the semicircular canals. Marine or aquatic vertebrates are peculiarly adapted for this study, since the body is buoyed up by the water, and as the semicircular canals of the shark's ear are very large they were selected for experiment. An abstract of his observations, which show that the semicircular canals are not an equilibrating organ, has been published, but another season's work will be necessary before the full account can be prepared for publication.

Prof. McMurrich has published an account of his studies of the "test cells" of ascidian eggs, and he also made a beginning in the study of the development of the skull in the Syngnathidae.

A paper, with illustrations, giving an account of the transformation of the Pluteus of Arbacia into the young sea urchin, by Mr. Colton and Mr. Garman, will appear in a few days.

Enough progress was made in my own study of the Medusae of Beaufort to enable me to print a list of the Beaufort species, with descriptions of the new ones. The list is now in press and it will appear in a few days.

I hope that the coming season's work will enable me to print a larger illustrated paper on this subject, as I now have more than three hundred drawings.

I also made satisfactory progress in the study of the development of the Macroura and traced the life history in several important genera. This work will employ me for several years, and although my notes on certain genera are now nearly complete I have not yet prepared any of them for publication except a paper on the metamorphosis of Lucifer, which has been printed with eleven plates, in the Phil. Trans. of the Royal Society. The chief importance of this work will be in the comparison of the various forms, and as this cannot be fully illustrated until I have completed all my observations, it seems best to lay my results aside until I have all the material which I need for an exhaustive monograph of the subject.

During five weeks in July and August, Dr. S. F. Clarke conducted, at the laboratory, an elementary course in Zoölogy, lecturing daily, and aiding the members of his class in the dissection and study of typical marine animals. All the members of this class were teachers of natural science, who had already worked at Zoölogy, but had not, before, found opportunities for the thorough study of marine forms. The course was so

profitable that several members of the class were able, after it closed, to engage in original research under my direction, and to make valuable additions to knowledge. With proper facilities at the laboratory, elementary instruction of this sort might be made an important feature of our work, but we all suffered from over-crowding last summer, and our present accommodations are no more than sufficient for the advanced workers who wish to make use of them.

Very respectfully yours,

W. K. BROOKS.

F.

Report on the Saturday Class in Latin.

To the President of the Johns Hopkins University:

SIR: The class for the instruction of Teachers in the elements of Latin was held for the first time on October 28, 1880, and was continued on successive Saturdays to March 19, 1881, excepting December 25 and January 1. There were therefore in all twenty sessions, and each session lasted two hours, from ten a. m. to twelve m. In the original announcement of this course the following points deserve attention:

(1) Formal instruction was offered to those only who had no knowledge whatever of Latin to begin with.

(2) Teachers who by reason of the above restriction were prevented from joining the class formally were invited to be present as auditors, if they thought it desirable.

It was no doubt the rigid adherence to the former of these points that prevented the class proper from reaching the proposed number of twenty persons. There were, originally, I think, only eleven applicants; of these two dropped out after a few lessons, and three joined later; so that twelve may be taken as the average number of members of the formal class. But besides these there were present daily a number of auditors varying from six to twelve or fourteen, usually the larger number: many of these were quite as regular in their attendance as the members of the class itself and manifested a great degree of interest in the proceedings. I made little notes of the work done on each day. These of course can be of no general interest; but I may say that I find that on November 27, the 6th lesson, the class was able to make out a small passage of Cæsar. From that time on a large part of each session was devoted to the work of practice in interpreting continuous Latin; and I find that on January 29, the 18th lesson, I began the 2nd book of the *Æneid* with them, at first merely explaining the metre and teaching them how to scan it. By the time the last session was reached the class had read with me some twenty chapters of Cæsar, B. G., and some hundred or more lines of Virgil. They were well acquainted

with the forms and general syntax: with the principles of the *Oratio Obliqua*, and with Prosody: and were, in a word, so far advanced into the heart of the subject, that I am convinced that each member of the class felt a sure confidence that the path was now open and clear for an intelligent and delightful progress in the knowledge of Latin, if he should choose to keep up the study.

The success of the experiment was very gratifying to me. Considerably more could have been accomplished in the same amount of time if the class had had leisure to do more work in the intervals between the lessons. But it is to be remembered that they were all teachers, whose week-days were fully occupied with exhausting labour, and who could therefore steal only a few quarter hours to make preparation for the Saturday's Latin class. Under the circumstances I think they did admirably well: and I am personally so well satisfied with the result, that I shall be ready at any time to make a similar experiment in the teaching of Greek, if it seem to the authorities of the University to be worth while: and I shall confidently anticipate an even more conspicuous success. For I am convinced that in no other method so well can the principles of teaching languages be applied, which Prof. Gildersleeve has so clearly enunciated: "the maximum of forms, the minimum of syntax, and early contact with the language in mass."

CHARLES D. MORRIS.

June 3, 1881.

G.

Report of the Librarian.

The report of the Librarian, Dr. W. Hand Browne, dated June 1, 1881, referred in part to matters of internal administration. The following extracts are of more general interest:—

During the summer of 1880 I took in hand the subject catalogue, which was greatly needed, and trust to finish it this summer. Instead of attempting the whole at once, in which case no part would have been serviceable until all was done, I took up and catalogued single departments at a time. The departments of Biology (including Botany, Medicine, and Hygiene); Chemistry (including Mineralogy, Geology, and Palaeontology); Physics (including Mechanics and Engineering); Mathematics (including Astronomy); Greek and Latin authors and Philology; English Language and Literature; Romance Languages and Literature; and Philosophy (including Logic and Metaphysics)—are all complete to date and in use.

Our small philosophical library has been increased by the purchase of a valuable collection of 295 volumes (210 titles) from the library of Prof. C. S. Peirce. This collection, made with much care by Prof. Peirce for

his own use, follows the whole stream of philosophic thought from Aristotle to our own times, and is particularly rich in specimens of the leading metaphysical, logical, and theological works of the great Scholastic Doctors. Many of the books are of great rarity and beauty; a number are *incunabula*, and interesting from a bibliographical point of view; and there are among them several valuable manuscripts, one of which, a handsome MS. on vellum of the *Sententie* of Petrus Lombardus, is said—for it has no colophon—to be as early as the twelfth century. It is doubtful whether a similar collection exists in any library in this country.

There have been received as gifts during the year 118 volumes and 86 pamphlets of more than ephemeral value. To the kindness of Mr. Henry Holt, of New York, we are indebted for 41 volumes of recent publications of his firm, comprising valuable works of biography, travel, history, art, belles-lettres, &c. Prince Louis Lucien Bonaparte, of London, has presented us with a series of seven versions, in various dialects, of the Gospel of St. Matthew, printed at his private expense. The Very Rev. A. Magnien, Rector of St. Mary's Seminary, has given us eleven handsomely bound volumes, and the Rev. J. Perron, President of Woodstock College, five volumes from the press of that college. We are also indebted to the Provost and Senior Fellows of Trinity College, Dublin, for a copy of their noble folio edition of *The Book of Leinster*, being a collection of poetic and historical writings in the Irish language compiled in the 12th century, and now reproduced in fac simile from the original MS. in the library of Trinity College.

We have now on our shelves 10,672 bound volumes, an increase of 2,541 volumes, or 1,551 titles since June 1, 1880.

[Since this report was made, the subject-catalogue has been completed, and the number of bound volumes increased to over 12,000.]

H.

List of Donors to the Library, September 1, 1880, to September 1, 1881.

- ALLAN, COL. W. (Author). *Campaign of Genl. T. J. Jackson in the Shenandoah Valley*. Philadelphia: 1880. O.
- AUSTIN, T. T. *Aromatische nitroverbindungen*. Berlin: 1876. O.
- BILLINGS, J. S., M. D., Surgeon U. S. A. *Index Catalogue of Library of Surgeon-General's Office*. Vols. 1 and 2. Washington: 1880-81. O.
- BONAPARTE, PRINCE LOUIS LUCIEN. *Seven dialectic versions of St. Matthew's Gospel*. London. (v. d.) D.
- BRANDT, H. C. G. *Lessing's Nathan*, with introduction and notes. New York: 1880. D.
- BROOKS, DR. W. K. Hall, J. *Natural History of New York. Palaeontology*. 2 vols. Albany: 1880. Q.

- BROWN, HON. GEO. WM. (Author). *Sketch of the Life of Thos. Donaldson*. Baltimore: 1881. O.
- CLARKE, C. C. P. (Author). *The Commonwealth Reconstructed*. New York: 1878. O.
- COOK, G. H. *Report of State Geologist of New Jersey*. Trenton: 1880. O.
- DUNSTER, S. (Author). *Henry Dunster and His Descendants*. Central Falls: 1876. D.
- FLINT, C. L. *Twenty-first Annual Report Massachusetts Board of Agriculture*. Boston: 1874. O.
- GILMAN, PRESIDENT D. C. *Miscellaneous Writings of F. Lieber*. 2 vols. Philadelphia: 1881. O.
- GORE, G., LL. D., F. R. S. (Author). *The Art of Scientific Discovery*. London: 1878. D.
- GREEN, S. A., M. D. *Green's Early Record of Groton*. Groton: 1880. O.
- ELLIS, G. E. *Memoir of J. Bigelow*. Cambridge: 1880. O.
- HALLIWELL-PHILLIPS, J. O. (Author). *Memoranda on the Tragedy of Hamlet*. London: 1879. O.
- Memoranda on Love's Labour's Lost*. London: 1879. O.
- HAZARD, R. (Author). *The Credit Mobilier of America*. Providence: 1881. O.
- HOLT, H. Baker, H. B. *English Actors*. 2 vols. New York: 1879. D.
- Baker, J. *Turkey*. New York: 1879. O.
- Beerbohm, J. *Wanderings in Patagonia*. New York: 1879. D.
- Beers, H. A. *A Century of American Literature*. New York: 1878. D.
- Berlioz, H. *Selections from Letters, &c.* New York: 1879. D.
- Bessey, C. E. *Botany for High Schools and Colleges*. New York: 1880. O.
- Brassey, A. *Around the World*. New York: 1880. O.
- Brassey, A. *Sunshine and Storm*. New York: 1880. O.
- Conway, M. D. *Demonology*. 2 vols. New York: 1879. O.
- Cory, W. *Guide to English History, I.* New York: 1880. O.
- Creasy, Sir E. S. *History of the Ottoman Turks*. New York: 1878. O.
- Democracy*. New York: 1880. D.
- Dobson, A. *Vignettes in Rhyme*. New York: 1880. D.
- Escott, T. H. S. *England, Her People, &c.* New York: 1880. O.
- Farrer, J. A. *Primitive Manners*. New York: 1879. D.
- Fothergill, F. *The First Violin*. New York: 1878. D.
- Goodholme, T. S. *Domestic Cyclopaedia*. New York: 1877. Q.
- Grohman, W. A. B. *Gaddings with a Primitive People*. New York: 1878. D.
- Hardy, T. *The Trumpet-major*. New York: 1880. D.
- Hillebrand, K. *German Thought*. New York: 1880. D.
- Jackson, Lady C. C. *Old Paris*. New York: 1880. D.
- James, H. A. *Communism in America*. New York: 1879. Q.
- Jauvier, C. A. *Practical Ceramics*. New York: 1880. O.
- Johnson, R. *Famous Poems*. New York: 1880. D.
- Johnston, A. *American Politics*. New York: 1880. D.
- Kemble, F. A. *Records of a Girlhood*. New York: 1880. O.
- Lewes, G. H. *Actors and Acting*. New York: 1880. D.
- McCuan, J. C. *Egypt As It Is*. New York: 1877. O.
- Morgan, L. H. *Ancient Society*. New York: 1878. O.
- Newcomb & Holden. *Astronomy for Students*. New York: 1880. O.
- Packard, A. S. *Zoölogy for High Schools and Colleges*. New York: 1880. O.
- Rydberg, V. *Magic of the Middle Ages*. New York: 1879. D.
- Symonds, J. A. *Renaissance in Italy*. New York: 1879. O.
- Taine, H. *The French Revolution, I.* New York: 1880. O.
- Thornbury, W. *Life of Turner*. New York: 1877. O.
- Turgeneff, I. *Virgin Soil*. New York: 1877. D.
- Tylor, E. B. *Early History of Mankind*. New York: 1878. O.
- Walker, F. A. *Money*. New York: 1878. O.
- Wright, C. *Philosophical Discussions*. New York: 1878. O.
- KUHARA, M. *Journal of Chemical Society, Tokio, Japan*. 1880. O.
- LINDSLEY, J. B., M. D. *Report of Board of Health, Nashville, Tenn.*: 1879. O.
- McLANE, HON. R. M. *Journals of Congress, 1879-80*. 2 vols. Washington: 1880. O.
- MAGNIEN, VERY REV. A. Vallet, P. *Praelectiones Philosophicae*. 2 vols. Paris: 1880. D.
- Bonal, A. *Institutiones Theologicae*. 6 vols. Toulouse: 1879. D.
- Icard, H. J. *Praelectiones Juris Canonici*. 3 vols. Paris: 1880. D.
- MALLERY, G., LT. COL. *Study of Sign-Language among the N. A. Indians*. Washington. 1880. Q.
- MARQUAND, A. *The Princeton Book*. Boston: 1879. F.
- MARTIN, PROF. H. N. (Author). *The Human Body*. New York: 1881. O.
- MERRILL, C. W. *Bulletins of Cincinnati Pub. Library*. 2 vols. 1879-80. Q.
- MITSUKURI, K. *Modern History of Japan, (Japanese)*. 4 vols. O.
- MORSE, J. T. (Author). *Life of Hamilton*. 2 vols. Boston: 1876. D.

- NEWCOMB, PROF. S. American Ephemeris for 1883. Washington: 1880. O.
Catalogue of Stars. Washington: 1881. Q.
- NEW YORK STATE LIBRARY. Civil List, &c., of New York. Albany: 1870. D.
Centennial Celebrations of New York. Albany: 1879. O.
- FERRON, J., REV., S. J., PRESIDENT OF WOODSTOCK COLLEGE.
De Augustinis, A. M. De Re Sacramentaria. 2 vols. Woodstock, Md. O.
Mazzella, C. De Deo Creante. Woodstock, Md. O.
Mazzella, C. De Gratia Christi. Woodstock, Md. O.
Mazzella, C. De Religione et Ecclesia. Woodstock, Md. O.
- ROBB, J. A. Financial Reports, Mayor and City Council for 1880. Baltimore: 1881. O.
- RODGERS, ADL. J. U. S. Naval Observatory Reports on Solar Eclipses. Washington: 1880. Q.
- SALISBURY, E. E. Biographical Memoranda of Class of 1832, Yale College. New Haven: 1880. Q.
- SCUDDER, S. H. (Author). Devonian Insects of New Brunswick. Boston: 1880. Q.
- SEYFFARTH, PROF. G. (Author). Discoveries in Biblical Chronology. New York: 1880. D.
- SYLVESTER, PROF. J. J. Walker, J. T. History of the Great Trigonometrical Survey of India. Vols. 5 and 6. Dehra Dun.: 1879-80. Q.
Compte Rendu de l'Association Française. Paris: 1878. O.
- SMITHSONIAN INSTITUTION. Annual Report. Washington. O.
Henry's Researches in Sound. Washington. O.
Memorial of Joseph Henry. Washington. O.
- TRINITY COLLEGE, DUBLIN. The Book of Leinster. Dublin: 1880. F.
- TRUSTEES OF J. HENRY. Henry's Aeneidea. 3 vols. London: 1873-9. O.
- UNITED STATES. Coast and Geodetic Survey.
Report for 1877. Washington: 1880. Q.
- UNITED STATES. Department of Interior.
Report on Rocky Mountain Locust. Washington: 1880. Q.
Ledy, J. Freshwater Rhizopods. Washington: 1879. Q.
- UNITED STATES. Geological and Geographical Survey.
Allen, B. J. History N. A. Pinnipeds. Washington: 1880. O.
Dalton, C. E. Geology of High Plateaus of Utah. Washington: 1880.
- UNITED STATES. War Department.
Report of Chief of Engineers. Washington: 1879. O.
- WARREN, PROF. M. Babucke, H. De Quintiliani doctrina. Regimonti: 1866. O.
- WEEKS, R. D. (Author.) Jehovah Jesus. New York: 1880. D.

Pamphlets, brochures, etc., have been received from the following donors:

Azarias, Brother; Bogart, J.; Chisholm, J. J., M. D.; Davenport Academy of Natural Science; Gilman, President D. C.; Hale, Rev. C. R.; Hartwell, E. M.; Hazen, A. D.; Homes, H. A.; Hunt, T. S.; Jones, C. J.; Kimmel, Hon. W.; Maryland Historical Society; Medical and Chirurgical Faculty of Md.; Pacini, F., M. D.; Peyton, J. L.; Ross, D. W.; St. Louis Academy of Sciences; Sherman, Gen. W. T.; Smart, J. H.; Theobald, S., M. D.; University of California; United States Departments.

I. Publications.

The following Scientific Periodicals are issued under the auspices of the University:—

- I. *American Journal of Mathematics.* (Professor J. J. SYLVESTER, Editor). Quarto. Four numbers make a volume. Vol. I, 1878-79, (388 pp., 4 plates); Vol. II, 1879-80, (408 pp., 3 plates); Vol. III, 1880-81, (398 pp., 3 plates); Vol. IV, 1881-82. Subscription price, per vol., \$5.00, price per number, \$1.50.
 - II. *American Chemical Journal.* (Professor IRA REMSEN, Editor). Six numbers make a volume. Vol. I, 1879-80, (460 pp.); Vol. II, 1880-81, (456 pp.); Vol. III, 1881-82, (472 pp.); Vol. IV, 1882-83. Subscription price, per vol., \$3.00, price per number, 50 cents.
 - III. *Studies from the Biological Laboratory.* (Professor H. N. MARTIN and Dr. W. K. BROOKS, Editors). Four numbers make a volume. Vol. I, 1879-80, (496 pp., 39 plates); Vol. II, (In progress). Price, per vol., \$5.00; price per number, \$1.50.
 - IV. *The American Journal of Philology.* (Professor B. L. GILDERSLEEVE, Editor.) Four numbers make a volume. Vol. I, 1880, (539 pp.); Vol. II, 1881, (574 pp.); Vol. III, 1882. Subscription price, \$3.00 per volume.
-
- The Journal of Physiology.* (MICHAEL FOSTER, M. D., F. R. S., Cambridge, England, Editor in Chief.) This Journal will in future be published in America with the aid of the Johns Hopkins University, and will be issued from the University to subscribers. Six parts form a volume. Vol. I, 1878-79, (626 pp., 17 plates); Vol. II, 1879-80, (596 pp., 13 plates); Vol. III, (In progress). Subscription price, \$5.00 per volume.

The Official Publications of the University are as follows:

- I. An ANNUAL REPORT presented by the President to the Board of Trustees, reviewing the operations of the University during the past academic year.
- II. The UNIVERSITY CIRCULARS, issued from time to time, and giving current information as to the work here in progress or proposed.
- III. A REGISTER giving a list of the officers, academic staff, and students, stating generally the nature and amount of the instruction given and work actually done or in progress during the current year, and exhibiting in detail the scheme and regulations of the University.

Announcements of proposed lectures, courses of instruction, etc., appear in the University Circulars, or are separately issued from time to time.

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This Report covers the Academic year ending September 1, 1881. The Appendix contains some statements of a more recent date.



SEVENTH ANNUAL REPORT

OF THE PRESIDENT OF THE

JOHNS HOPKINS UNIVERSITY

Baltimore Maryland

1882

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The names in each group are arranged alphabetically.

SEVENTH ANNUAL REPORT

OF THE PRESIDENT OF THE

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Baltimore Maryland

1882



BALTIMORE
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SEVENTH ANNUAL REPORT.

To the Trustees of the Johns Hopkins University :

You requested me by a formal resolution to present in my last report a review of the work done in the various departments of this university since the opening in 1876, but circumstances beyond my control prevented me from complying with this expressed wish. I am now able to make such a summary as will enable you to judge of the results which have been reached during the past six years. This period is too brief to form a complete estimate of the work which is in progress; but it is long enough to show the principles which are here in operation and to indicate their tendency. It may be said of us, using the words of a recent writer in another connection, that the university has passed "out of the stage of prospectus into the stage of existence." It is a living force, attracting the attention of scholars far and wide, drawing students from almost every part of the Union, and visited frequently by observers of educational progress from foreign lands.

We have continually kept in mind that the principal object of this university is to educate

young men, and to certify to their attainments by careful examination and the bestowal of academic honors. In order that they may be well taught, instructors have been chosen who were already renowned, or who gave promise of marked distinction in the departments to which they were devoted. Consequently the academic staff is made up of men whose early training has been very different, and who bring to bear upon our incipient plans the experience of time-honored institutions, European and American. These instructors have been encouraged to continue their own investigations and studies, and the requisite apparatus and books have been liberally provided. They have also had the means of publication; and they have contributed heartily, each in his own way, to the intellectual activity of the other educational institutions of Baltimore, whenever invited to do so.

But they have never lost sight of their chief duty to the university, the guidance, instruction, and inspiration of young men, by example and by lessons; and to this end they have freely employed the laboratory, the lecture, the recitation, the examination, and the private conference, according to the circumstances of each case, so that every youth coming here for his education might be assured of the best aid which we could give him in the development of his mental powers and the formation of his character.

Some of our students have been already trained in good colleges, and come to us for the advanced opportunities which are here provided, and others are of the usual college age seeking to lay solid foundations for their future special pursuits.

I have often called attention to the distinction which we are endeavoring to make between university education and collegiate training, both of which it is here our endeavor to promote. May I be excused for repeating some of the phrases hitherto used upon this subject, so important does it seem to reiterate these views until they are fully understood.

According to acknowledged precedents still rigidly followed in the old world, universities exercise these four distinct functions: they provide advanced instruction in the chief departments of literature and science, and usually, also, in one or more of the so-called learned professions; they encourage investigation and the publication of important researches; they confer degrees; and they establish laboratories and bring together all necessary apparatus such as books, instruments, works of art, and collections in natural history.

Collegiate instruction is properly introductory to university teaching; it is elementary, formal, and disciplinary. It is largely devoted to the training of the intellectual powers and the formation of habits of attention, acquisition, memory, and

judgment, while it stores the mind with the elements of knowledge. A university cannot thrive unless it is based upon a good collegiate system; and it may rightly encourage or establish a college, if needed, as an important department of its activity.

There is a legitimate distinction between the earlier and later phases of a liberal education—the stage of discipline and the stage of guidance, the period of rules, tasks, and control, preceding the period of stimulating and quickening inspiration; but there is no doubt that both methods of training are in some degree appropriate throughout the academic life. There are likewise two kinds of professors—those who are best fitted by their patient and exact habits of intellectual action, by their well-stored memories, and by their logical modes of expression, to drill the classes over which they are placed; and there are others who have a gift for investigation, who are acute in suggesting important questions to be settled, and ingenious in devising the proper methods of solution—who delight to apply the touch-stone of truth to every doctrine, and to carry the light of modern science into every field. Sometimes both sorts of power are found in one individual.

The disciplinary method of a college calls for men of high social, mental, moral, and religious character, for they are to be concerned in molding

the dispositions of young men, and in forming their habits at a critical period of life, when the parent begins to relax his authority and the youth has not learned to govern himself. It requires as professors those who were born to be teachers, who delight to act upon youthful minds, to inspire them with lofty motives, to train them by the best methods, to emancipate them from the slavery of sloth, to set before them noble examples, to cherish their faith. The lessons to be inculcated during a college course include obedience to recognized authority, the performance of appointed tasks, punctuality in meeting all engagements, and attention to physical development. To acquire knowledge, to master the arts of clear reasoning and fit expression, to test the capacity for different kinds of intellectual exertion, to develop a desire to master difficulties, and to form intellectual friendships and associations, are among the ends to be sought in a college life. Such discipline implies but little freedom; but restraints, if wisely adjusted, are found to be as welcome to the scholar as they are to the athlete.

University methods, assuming that the students have already received this earlier discipline, that they are in earnest in the acquisition of knowledge, and that their characters are nearly formed, require less rigid processes of education. Opportunities, advantages, assistance are freely provided, but the

benefit derived from them must depend upon the individual. He may fail of his degree at the end of his course, but his daily deficiencies will not be charged against him. He may forfeit the confidence of his teachers, or even his membership in the university; he may fail to equip himself for his chosen career; but he can not be forced to learn his lesson or be brought under daily examinations. He must meet, as he does in life, the rewards of his own conduct. Nor will he be kept back by the neglect or dullness of his comrades. The fleetest of foot may travel as he will, without being hindered by those who are fettered. If the student have talents, or the rarer gift of genius, he may learn how to cultivate his powers most advantageously. He will find ready introduction to the writings of those who have been leaders of ancient and modern thought; he will have access to new and costly instruments of investigation; he may aspire to the attainment of a lofty ideal, sure of appreciative counsel from those who know the difficulties and the snares of an intellectual life; he may readily become acquainted with the state and tendency of science in every part of the world, and thus may be trained to make his own contributions to the progress of knowledge and the welfare of mankind. Teachers free from the routine of collegiate instruction, may be most serviceable in

the prosecution of scientific research, and most capable of giving aid to those who are already strong enough to walk alone. There is a sense in which it is true that the best of all teachers is the original investigator. His methods are not adapted to beginners. His followers may be few. But if his mind is endowed with rare qualities which have been assiduously cultivated under favorable circumstances, he will exert a powerful influence upon those who are able to follow him; he will incite his fellow teachers to constant activity; he will draw around him other superior minds; he will bring enduring renown to the university of which he is a member.

Our college work, I am glad to say, begins to be well understood and rightly valued by the people of Baltimore. The number of professional men, for example, clergymen, lawyers, and physicians, who know exactly what a good education should be, and who are now entrusting their sons to our training, is so large as to be very gratifying, and to make us, if possible, more eager than ever to maintain such methods and uphold such standards as experience shows to be the best. We appreciate the reasons why a distant college may be attractive to the youth of the city, but it is our aim to give all who come to us certain peculiar advantages, which they cannot find elsewhere. We have not adopted the plan of bringing

students together in dormitories or at a common table, for we have seen that home life, or that which approaches as nearly as possible to home life, has its own counterbalancing advantages, and that the protective and liberalizing influences of a large city may be conducive to the intellectual and moral development, as well as to the social culture of young men engaged in college work.

To undergraduate as well as graduate students Baltimore presents many special attractions. The cost of lodging and board in excellent private families is moderate. Those who are willing to go a mile or more from our buildings, may find dwelling places at low prices, readily accessible by the horse cars. The libraries of Baltimore, the Peabody, the Historical, and the Mercantile, are excellent, and constantly increasing. The Pratt library will soon be added to the number. The classical concerts of the Peabody conservatory of music are sustained every winter by skilful masters, with the aid of a generous fund. Annual courses of public lectures on the Peabody and Hopkins foundations afford an opportunity to hear the best speakers. There are parks and gymnasiums for recreation and exercise. The religious opinions of all are respected, and churches of every denomination are to be found in the city. Washington may be reached by express trains in an hour. The various libraries and

scientific establishments of the national government may readily be visited, and the work of the legislative, judicial, and executive departments of the capital may incidentally be observed.

A careful review of the opportunities in Baltimore for collegiate education was written last spring, and is appended to this report. I wish it might be read by all the parents in this community who may desire to give their sons a liberal education. I wish it might incite more young men in this large city to avail themselves of the great advantages here offered.

The Johns Hopkins University is an unsectarian foundation. Like the city in which it is placed, it includes among its members those whose opinions and beliefs are widely divergent. But it is not an irreligious foundation because it assumes no distinctive name. It inculcates the love of truth, not only in the daily relations of man to man, but in the defence of opinions, in the prosecution of research, and in the formation of mental habits. It insists upon uprightness of conduct in all its members. Yet in accordance with the usages of other well known colleges, which commonly bear denominational names, it lays down no test or creed for the assent of students or professors. The trustees have expressed a desire to see the university pervaded by a spirit of enlightened Christianity; the ethics taught is Christian ethics; the daily religious

service is Christian worship; but it is obviously inexpedient for the university to become identified with any one religious body. The abundance and diversity of churches in this community is such, that while our officers and students are of many denominations, they are able to maintain the relations which their own consciences approve.

The character, aim, and influence of the university foundation must be discovered in the conduct and utterances of those who administer its affairs, and by its results in a course of years.

NUMERICAL STATEMENTS.

During the year now closing, the interior work of the university has been as successful as ever. Classes have been taught in the various branches of higher mathematics, in chemistry and mineralogy, physics, biology, (including physiology and comparative anatomy); in history, political economy, ethics, logic, and psychology; in Greek, Latin, Hebrew, Sanskrit, French, Italian, Spanish, German, Anglo-Saxon and English. Twenty-four young men completing their courses of study, and passing the requisite examinations, have come forward to take their degrees. Good order, devotion to study, and enthusiasm in literary and scientific pursuits, have characterised the older and younger

scholars. A larger number than usual have matriculated, and an abundance of openings have been ready for those who were prepared to begin an active career.

The academic staff included during the year forty-three teachers, seven of whom were non-resident lecturers. In addition to this staff, five professors, not otherwise connected with the university, acted as examiners in particular subjects where their judgment was sought. The number of students enrolled during the year was one hundred and seventy-five, of whom ninety-seven were residents of Maryland, and sixty-eight came here from twenty-one States of the Union, and ten from foreign countries. Among the students were ninety-nine already graduated, coming from fifty-two colleges and universities; there were forty-five matriculates, (or candidates for the degree of bachelor of arts), and there were thirty-one admitted as special students, to pursue courses of study for which they seemed fitted, without reference to possible graduation. The daily attendance upon eighty-three public lectures was one hundred and thirty-seven,—ascertained by the count of the door-keeper. The number registered at the opening of the present academic year is one hundred and ninety-two, of whom one hundred and ten are graduate students.

The following table indicates the enrollment of students in each year since the university was opened in the autumn of 1876:

	Graduates, (incl. Fellows.)	Matriculates.	Non- Matriculates.	Total Enrolled.	Average Attend- ance at Public Lec- tures.
1876-77	54	12	23	89	60
1877-78	58	24	22	104	84
1878-79	63	25	35	123	96
1879-80	79	32	48	159	113
1880-81	102	37	37	176	186
1881-82	99	45	31	175	187
*1882-83	110	49	33	192	

*As shown by the preliminary list at the opening of the academic year.

The attendance upon some of the principal courses during the last four years has been as follows:

	1878-79.	1879-80.	1880-81.	1881-82.
Mathematics,	33	31	31	33
Physics,	32	38	35	42
Chemistry,	39	46	40	44
Biology,	26	32	25	32
Greek,	40	36	31	33
Latin,	27	40	40	39
German,	55	60	55	47
French, Italian, etc. .	18	39	33	26
English,	*	19	29	22
History, etc.	19	33	40	40
Logic,	6	16	13	9
Philosophy and Ethics,	6	12	14	22

*Not recorded.

Looking over our register for the last six years, it appears that four hundred and forty-nine individuals have been here enrolled as students, of whom two hundred and fifty-one have come from Maryland, (including two hundred and four from Baltimore), and one hundred and ninety-eight from thirty-five other states and countries. Of this number two hundred and seventy-five persons pursued courses as graduate students and one hundred and seventy-four as collegiate students.

The university has become a sort of national seminary for the training of teachers, over one hundred of those here taught having become professors and instructors in colleges, academies, and schools. But this is not the only calling for which young men are prepared. Seventy-eight are physicians and students of medicine; thirty-one are clergymen and students of theology; twenty-nine are lawyers and students of law; forty-three are engaged in business (as chemists, engineers, electricians, manufacturers, merchants, etc.); and a few have entered the scientific service of the U. S. Government.

From these general remarks let me proceed to speak of each of the principal branches of study, and to exhibit, as far as I am able, the various steps by which we have reached our present position.

MATHEMATICS.

At the beginning of our academic life, Professor Sylvester, of London, accepted an invitation to the chair of mathematics, and he brought to our counsels long experience as a teacher and great renown as a writer and thinker. He was a member of the chief scientific societies of Great Britain and the Continent, and had received many academic honors. Since he came to Baltimore, the Royal Society of London has bestowed upon him its highest scientific distinction, the Copley Medal, and the University of Oxford has honored him with the degree of D. C. L. He has lectured annually to a company of advanced mathematicians, most of whom have been looking forward to professorships; he has established the American Journal of Mathematics; and has written many original memoirs, not only for his own journal, but for other scientific periodicals. He has also encouraged the preparation of valuable papers by several of his pupils.

At his suggestion, Professor Cayley, of the University of Cambridge, was invited to spend some months of the year just closed in Baltimore, and kindly consented to come and lecture alternately with Professor Sylvester to the same advanced students. His residence among us continued from January to June. His instruction during this period was heartily appreciated by the not incon-

siderable number who were capable of following his masterly lectures, and has given a permanent impulse to the studies of the university in the highest walks of mathematical science. The number of students following these two lecturers, was fourteen. Various brief courses on special advanced subjects were given during the same half-year by Messrs. Peirce, Story, and Craig.

Mr. W. E. Story, Ph. D., a Harvard graduate, who continued his studies in Leipsic for several years, was the first associate appointed in mathematics. Mr. Thomas Craig, Ph. D., a graduate of Lafayette College, who was one of the first persons elected to a fellowship among us, has also become an associate, giving up on this account advantageous appointments offered to him elsewhere. More recently, Mr. Fabian Franklin, Ph. D., after having been successively a student, a graduate, a fellow, and an assistant, has been promoted to the rank of associate.

The courses of lectures have varied annually, so that a student resident at the university during a term of three years, more or less, has had an opportunity to apply himself to many different mathematical subjects. Among the courses which have been given are the following:

Determinants and Modern Algebra (1876-79).

Theory of Numbers (1879-82).

Algebraical Geometry, in connection with the Abelian and Theta Functions (1882).

Clebsch-Gordan Invariantive Theory (1882).

Construction and Dissection of a Riemann's Surface (1882).
 New Theory of Universal Multiple Algebra (1882).
 Quaternions (1877-82).
 Elliptic Functions (1878-80; 1881-82).
 Higher Plane Curves, Advanced Course (1880-82).
 Solid Analytic Geometry (1878-82).
 Total Differential Equations (1877-82).
 Partial Differential Equations (1880-82).
 Calculus of Variations (1879-80; 1881-82).
 Spherical Harmonics (1878-80; 1881-82).
 Cylindric or Bessel's Functions (1879-80).
 General Theory of Functions, including Riemann's Theory (1879-81).
 Definite Integrals (1876-77).
 Determinants (1880-81).
 Modern Algebra (1880-82).
 Higher Plane Curves, Elementary Course (1878-82).
 Theory of Equations (1876-82).
 Differential and Integral Calculus (1876-82).
 Conic Sections (1876-82).
 Modern Synthetic Geometry (1877-78).
 Gauss's *Theoria Motus* (1877-78).
 Theoretical Mechanics (1877-82).
 Mathematical Theory of Elasticity (1876-78; 1881-82).
 Hydrodynamics (1879-81).

Lectures have also been delivered in allied departments on Mathematical Physics, and on Mathematical Logic.

The instructors and more advanced students in mathematics have held monthly meetings under the presidency of Professor Sylvester, assisted by Dr. Story, as a mathematical seminary, which constitutes in fact the mathematical society of the university. During the last three years, papers on the following subjects have been presented and discussed :

CAYLEY, A. Two cases of the quadric transformation between two planes; a problem of analytical geometry; a geometrical representation of an equation between two variables; associative imaginaries; formulæ of trigonometry.

- CRAIG, T. Proof of Abel's theorem; a geometrical theorem; areas of corresponding surfaces; note on an n -fold potential.
- DAVIS, E. W. Binodal quartics.
- DURFEE, W. P. Properties of the numerical solutions of $ax^2 - y^2 = -1$.
- ELY, G. S. Partitions; note on the determination of the number of the even and of the odd integer roots of an equation.
- FRANKLIN, F. A deduction from the properties of a system of three circles; v. Gall's table of groundforms for the octavic; new proof of Euler's development of the infinite product $(1-x)(1-x^2)(1-x^4)\dots$; notes on Newton's method of approximation, etc.; a class of differential equations; probability of the existence of an error in the result of a certain computation; cubic curves; cubics and systems of conics.
- HATHAWAY, A. S. Generalized forms of trigonometrical ratios; general method in congruences and its application to the theory of the divisors of cyclotomic functions of every class; similarity between congruences and equations and its significance; cyclotomic functions, considered with respect to a prime modulus p ; modular functions.
- MITCHELL, O. H. Completion of Fermat's theorem; binomial congruences; completion of Wilson's theorem, and the number of n th residues; properties of the roots of $x^2 \equiv x \pmod{k}$; theorem including Fermat's and Wilson's theorems; binomial congruences $(\text{mod. } p, f(x))$; residues of symmetric functions; partitions; determinants of powers.
- PEIRCE, C. S. Relative forms of quaternions; proof that there are only three linear associative algebras in which division is an unambiguous process.
- PERRY, H. M. Rule of signs in determinants; singular solutions.
- PRENTISS, R. W. Problem in maxima and minima; a geometric locus.
- STORY, W. E. Generalized form of analytical triangle; volumes and surfaces of n -dimensional spheres; two kinds of k -th totients; notation for totients; system of conchordal conics; analytical proof of some properties of binodal quartics; non-Euclidean trigonometry; outline of Clebsch & Gordan's method of finding the ground forms of a binary quartic.
- STRINGHAM, W. I. Vector ratios considered as trigonometric functions of angles; rotation in four-dimensional space.
- SYLVESTER, J. J. Triangles in- and ex-scribable to a general cubic curve; resultant of two congruences; prerogative of a ternary denominational system of coinage; multisection of the roots of unity; certain integrable class of differential and finite-difference equations; completion of the author's method of obtaining the groundforms to any binary quantic or system of binary quantics; question in partitions; geometrical proof of a theorem in numbers; geomet-

rical treatment of a theorem in numbers; properties of a split matrix; nonions; mechanical involution.

VAN VELZER, C. A. On a condition that the total differential equation $Pdx + Qdy + Rds + \dots + Tdv = 0$ may admit of a single primitive; certain compound determinants.

PHYSICS.

Early in 1875, Mr. H. A. Rowland, then of the Rensselaer Polytechnic School in Troy, whose papers on magnetic distribution and permeability had already attracted the attention of Clerk Maxwell and other physicists, was called to the service of this university and encouraged to go abroad for the purpose of visiting new physical laboratories and of purchasing instruments. He was subsequently chosen professor of physics, and has since lectured annually to advanced students on heat, electricity, and magnetism. He has also been responsible for the guidance of their laboratory work. Professor Rowland has had great facilities for the prosecution of original researches and has justified in this respect the confidence reposed in him. His attention was first directed to a determination of the absolute value of the ohm. He soon afterwards proceeded to a re-determination, by a method of his own, of the mechanical equivalent of heat. The experiment was conducted in part at the cost of the Rumford fund of the American Academy, and the results

were published in the proceedings of that society. The historical study of this subject was communicated to the Institution of Science, Letters and Arts, in Venice, in response to their offer of a prize,—and it received from this society the premium of fifteen hundred lire. Recently, Professor Rowland has been engaged in the analysis of the solar spectrum. He devised an instrument for the ruling of “gratings,” which give better results in spectrum analysis than have ever before been reached. The photographs of the spectrum thus obtained are most noteworthy. By making these gratings on concave surfaces, a new and very accurate method of comparing wave lengths has been obtained. The particulars of this advance in physics have been described in a recent number of the *Circulars*, and more will soon be published in regard to them.

It should here, perhaps, be mentioned that at the request of the State Department, Professor Rowland attended as a delegate the International Congress of Electricians held in Paris, in the summer of 1881, and was made a member of an International Commission on Electric Standards.

To the position of associate in physics, Mr. C. S. Hastings, Ph. D., once of the Sheffield Scientific School, and later, the holder of a Tyndall scholarship, was invited. He has given annually the course in general physics, taking up in lec-

tures and exercises the subjects of mechanics, light, heat, electricity, magnetism, etc. He has had excellent apparatus at command for demonstration in addition to that provided for investigation. Dr. Hastings has also carried forward a long and careful study of the astronomical objective, for the purpose of discovering the theory by which such a lens should be constructed. He has recently made three lenses according to the theory which he had worked out, and they have been pronounced satisfactory in a high degree. Dr. Hastings has also given much attention to astronomical physics, and has had a private observatory in which he has observed celestial phenomena. He has also lectured from time to time on this class of subjects, one such course having been given by request to a select company of astronomers in Washington, at the Smithsonian Institution. These gentlemen subsequently addressed a letter to the trustees, indicating the profit they had derived from his lectures, and especially from that part of them which related to the improvement of the telescope.

In 1879-80, an investigation of an action, hitherto unobserved, of the magnet on electric currents was carried on by Mr. E. H. Hall, then a fellow, at the instance of Professor Rowland.

The physical apparatus is new and good. A very large number of instruments intended for

research have been bought of the makers, and others have been manufactured here by Mr. Schneider, the mechanician of the university, whose skill is deserving of much commendation. Others have been bought for the purpose of illustrating the general course of lectures, and others again for the use of properly qualified students who wish to become familiar with the exact methods of physical inquiry. It is unfortunate that this costly apparatus is not more conveniently arranged, and that better rooms are not provided for the delicate investigations which are in progress. One of our most pressing wants at the present time is a good building for the physical laboratory. Such buildings are not common in this country, but their importance is so obvious that generous individuals have recently given large sums for their construction at Cambridge and New Haven; and within a very short time we may expect to see the colleges in both those places better equipped than we are for the study of physics, unless indeed the trustees of this foundation see the way clear to build such a laboratory in Baltimore.

There seems to be a special demand at this time for trained physicists, and the students of this department have been called to good positions quite as soon as they were ready to go.

CHEMISTRY.

Professor Remsen, then of Williams College, Mass., was invited to the chair of chemistry in 1876, and a laboratory was immediately built under his direction, adapted to the needs of about forty chemists. More than that number of students have recently sought admission at the same time, and the laboratory is consequently being enlarged to a much greater capacity. Dr. Remsen has given the annual course in general chemistry, an annual course in organic chemistry, besides other advanced courses on thermo-chemistry and the history of chemistry. He has, further, directed the practical work of the students.

Ever since the organization of the laboratory, researches in various directions have been carried on constantly, the results of which have appeared in the American Chemical Journal and the principal foreign journals of chemistry. The main line of investigation has followed a group of phenomena observed in oxidizing the substitution-products of the so-called aromatic hydrocarbons. A law of wide application governing these phenomena has been discovered, and other results of value have been obtained. While the substances which have formed the special subjects of the studies are themselves not familiar to laymen, the principle established is applicable to familiar facts, throwing much needed light upon them.

Among many incidental services which have been rendered to the public by our chemists, the most noteworthy has been a study of the drinking waters of Baltimore, which was undertaken at the request of the civil authorities, to ascertain the cause of the so-called *cucumber*-taste, at certain times quite disagreeable. Professor Remsen showed conclusively that many supposed causes of this taste were not real. His investigation allayed much anxiety on the matter, and led to his being invited by the civil authorities of Boston to make a like investigation in and near that city. Here he was so fortunate as to discover that contamination in one of the sources of supply, was due to the presence of a fresh water sponge, *spongilla lacustris*. Under the auspices of the National Board of Health, Professor Remsen has investigated the subjects of "organic matter in the air," and "carbonic oxide as a source of danger in apartments heated by cast-iron stoves and furnaces." He had also begun a complete investigation of the question of water contamination by sponges, but the failure of Congressional appropriations has, at least temporarily, put an end to this work.

The establishment of the American Chemical Journal is referred to on a later page.

The associate, Mr. H. N. Morse, Ph. D., once of Amherst College, has given a part of the lectures, and has had constant oversight of the

laboratory. Recently he has begun to give instruction also in mineralogy, and has been quite successful in building up the cabinet of minerals. George T. Marye, Esq., of San Francisco, is making constant and generous additions to this collection, illustrating the mineral wealth of the Pacific States, and his contributions are to be brought to us across the continent, without charge, by the liberality of Messrs. Wells, Fargo & Co., and the Adams Express Company.

Some of the students of the chemical laboratory have gone into business pursuits; others are engaged as professors and teachers.

BIOLOGY.

As we looked forward to the time when the study of medicine would be especially promoted in this university, in connection with the hospital founded by Johns Hopkins, attention was given in our earliest plans to the study of the biological sciences, in order that young students expecting ultimately to become physicians and surgeons, might receive in the preceding collegiate course, the most suitable training for their useful and difficult calling.

The medical department of the university is not yet organized, but a very considerable number of students have been here taught physiology and morphology, by the methods of modern biological

science, and have gone from among us to professional schools. Many resident physicians have also availed themselves of the opportunities here afforded to become acquainted with the most recent advances in these branches of science.

The head of the biological department is Professor Martin, a graduate of the University of London, and of the University of Cambridge, and he has directed his attention chiefly to the science of physiology. Dr. W. K. Brooks, from the Museum of Comparative Zoölogy, Cambridge, Mass., has been from the beginning an associate in biology, and has given instruction in animal embryology and morphology. There have been other excellent adjuncts in the biological staff, all promoted after prolonged studies among us, namely, Messrs. Sewall, Clarke, Sihler, Councilman, Sedgwick, and Wilson.

The course of studies recommended to students who expect to become physicians, (quite distinct from and antecedent to the strictly professional study of medicine, but quite as essential in these days to the liberal education of a medical man), is made up of physics, chemistry, and biology, with the addition of Latin, mathematics, psychology, and English literature, and with at least sufficient knowledge of German and French for the perusal of scientific works which are written in those languages. It was somewhat of a surprise to us that

the announcement of such a course should at first be received with hesitation by those who were in a position to judge of it, but we were soon informed that this hesitation was due to a lack of acquaintance with the purpose we had in view, and likewise to some quite secondary and perhaps infelicitous phrases which were employed in the original announcements. We were presently confirmed in the course we had adopted by the very encouraging letters received from a number of eminent physicians in Great Britain, several of whom had long been familiar with the professional schools of England, Scotland, and Ireland. These letters were not in a form for publication, but they contained many valuable comments which were of service to the authorities of the university.

The following statement has been written by Dr. Martin, to show the character of the course in biology recommended to undergraduates :

"Among the subjects which students may take up after studying physics and chemistry, is biology, and this study is recommended to those who are preparing themselves to enter at a later period upon the professional study of medicine.

"When the undergraduate enters the biological laboratory, he does not at once begin the study of botany or zoölogy, or any subdivision of these, but gives attention during the first year to general biology—to acquiring a general knowledge of the forms assumed and the properties exhibited by living matter. For this purpose the student commences with the study of unicellular organisms; is next carried on through a series of types selected from the higher fungi, the cryptogamous, and the flowering plants; and is finally made to examine thoroughly a specimen from each class in the animal kingdom. These types form the texts for lectures and recitations upon general biological laws and the phenomena which they are selected to illustrate; but the main work is done

in the laboratory, so that the instruction has a firm practical basis, and the various technical terms are made intelligible through their illustration by the observations of the student himself. Having formed a good acquaintance with a number of adult forms the student next takes up embryology, the lectures on which are illustrated by a thorough practical study of the development of the chick, and a less extensive one of the developmental histories of some other animals. During this preliminary course the student also, with the aid of a selected series of skeletons, studies the main facts in human and comparative osteology. After its completion some specialization of study is permitted, and the more advanced a student is the more is this encouraged. In the next year, if he intends afterwards to enter a medical school, he takes up the study of animal physiology and histology; and also dissects one of the higher mammalia (dog or cat) with minuteness and care, and attends a short course of lectures on comparative anatomy. Students who do not look forward to becoming practitioners of medicine, may select animal morphology for special study in the second year of the biological course, in preference to animal physiology. Definite arrangements for the prosecution of botanical studies beyond the point to which they are carried in the first year of the biological course, have not yet been made.

"This undergraduate course, while primarily designed as a stepping stone for those who intend to become biologists, is at the same time complete in itself, and believed to be the form of biological instruction best adapted for those who do not expect to become either botanists, zoologists, or physiologists, but who desire to acquire some knowledge of the methods and ideas of modern biology, as one of the branches of general culture which they select among the studies leading to the baccalaureate degree."

I should be wrong if I gave the impression that the biological work of the university has been only directed to the training of future medical students. It has afforded instruction to several undergraduates of the university who selected biology as one of the subjects in which to stand examination for the B. A. degree, but who had no intention of ever studying medicine; and it has also been concerned in important researches, the results of which have been published in the *Journal of Physiology*, of which Dr. Michael Foster, of the University of

Cambridge, is the editor, and in *Studies from the Johns Hopkins Biological Laboratory*, edited by Professor Martin and Dr. Brooks; also in various other scientific periodicals, and in the transactions of learned societies.

As regards post graduate work in physiology the following statement has already been published :

"The relations of the university to the hospital seemed from the first to indicate animal physiology as a subject having special claims on us, and this opinion was confirmed by a consideration of the present status of that science in this country. Notwithstanding a small number of brilliant physiological discoveries made in the United States, and the fact that several distinguished physiological investigators are found here, it can hardly be said that America has taken her fair part in contributing to the modern advance of physiology. The costliness and variety of the accurate instruments required for modern physiological research almost preclude any but a well-endowed institution from obtaining them; hence the majority of medical students, even had they time, have not the opportunity of acquiring that practical knowledge of the methods of physiological inquiry which is so valuable an auxiliary in those therapeutical and pathological researches, which, conducted on the modern experimental method, have added so much in late years to the list of remedial agents at the disposal of the practising physician. Numerous good teachers do, no doubt, give instruction concerning those main facts already acquired which it is essential for the practitioner to know, but it seemed important to introduce a graduate course to train men as specialists in physiology, so that they might not only be qualified to teach it, but to add to our knowledge of the working of the living body, and to supply new facts for the physician to utilize. While chemistry has made good its position as a science which, though essential to those who practice medicine, has claim to a place in the circle of sciences apart from that or any other immediate practical application, physiology has only recently begun to advance into that fortunate position and to be pursued for its own sake, as it now is in many European countries; as yet in the United States it is but little studied, except in immediate connection with a medical curriculum. Manifold experience has, however, showed that a science rarely makes important advances when pursued merely as a means to some specific end to which it is made secondary; and as modern advances in the investigation of the action of drugs and in the comprehension of pathological phenomena are more and more arrived at by reasonings based on physiological results, and by experiments carried on by

physiological methods, the time seems to have arrived when, at least in certain centres, physiology should be made a subject of independent study.

"For the reasons briefly stated above, animal physiology has formed one of the subjects for special advanced study selected by the Johns Hopkins University; and of its subdivisions, more attention is given to what is commonly known as "experimental" than to "chemical" physiology, the latter being already fairly well provided for in several colleges. Of animal histology the same may be said. Therefore, while arrangements were made to enable any student to verify for himself the main points established in animal chemistry and histology, the chief endeavor has been to provide special facilities in the so-called experimental physiology, and the instruments brought together for advanced study and research in that branch of knowledge are believed to be more numerous and to cover a wider ground than those to be found elsewhere in this country. The laboratory is conveniently arranged for advanced work, the rooms occupied by those engaged in it being shut off from the general laboratory fitted up for the junior students.

"As to the method of selecting instruments the following statements may be of interest. Before the opening of the university the trustees placed at the disposal of Professor Martin, to whom was entrusted the organization of the biological department, a considerable sum, which was mainly expended in procuring the instruments and appliances essential for the various branches of undergraduate biological work. For instance, a number of microscopes were purchased, so that each student should have one for his own use; also the apparatus necessary to enable every one to repeat for himself, (as he is required to do when pain to an animal is not involved,) the more easy physiological experiments, and the apparatus necessary for the demonstration of such fundamental physiological facts as are too difficult for the less advanced students to carry out for themselves. Since that time the trustees have yearly provided \$1,000 for the purchase of new instruments; of these some are selected from those which have been described within the preceding twelve months and seem of value, or which, though older, are of general usefulness in the laboratory; the remainder are purchased for the execution of special investigations, so that, within reasonable limits as to cost, any one engaged in a research can have purchased or constructed for him such instruments as he may require. The collection of apparatus is, therefore, somewhat unique; starting with the general outfit of a physiological laboratory, and growing by the constant addition of the more frequently useful instruments for demonstration and class-work, it also contains many pieces of apparatus which were ordered for special ends; and both groups are added to yearly.

"A competent mechanic, at work on the premises, constructs some of the new apparatus, and also, which is more important, is always at hand for the immediate repair of any instrument which may get out of order."

With reference to the graduate instruction in zoölogy and comparative anatomy, another extract from the published announcements may here be given.

"The next question for consideration was what should be done to promote graduate study in zoölogy and comparative anatomy. Here again the best principle to adopt seemed to be, after arranging to give the ordinary undergraduate instruction as well as to provide the more essential appliances for advanced work in all branches of zoölogy, to select for special effort and encouragement the subdivision which should appear to be least commonly or efficiently promoted elsewhere.

"Facilities for advanced work in systematic zoölogy were already well provided in many educational institutions and also in connection with the national coast and territorial surveys, and the national and State fish commissions. Of comparative anatomy, so far as adult forms are concerned, almost the same may be said; but, with some well known exceptions, the study of the development of individual animals, considered in connection with problems of general animal morphology, has received less attention, although the American fauna affords many unique opportunities, and it is now generally believed that all scientific systems for the classification of animals and the recognition of homologies in the organs of different species, genera, and classes, must be mainly based on the study of the developmental histories of individuals.

"The university has accordingly not undertaken the formation of any extensive museum; such typical specimens are provided as are requisite for the satisfactory instruction of ordinary students of zoölogy, but there has been no attempt to bring together a vast collection such as specialists in systematic zoölogy require for their work. Such collections are found in several other educational centres, and, therefore, in accordance with the general principles of the university, were not considered as of primary importance here; while the fact that the national collections at Washington are within easy reach of persons residing in Baltimore should any point needing reference to a large museum arise, made it possible for the present to postpone the founding of a museum of natural history. Whether the university will ever undertake this task is a question for future decision. No doubt ready access to an extensive collection is of vast importance to every zoölogist, a museum being to him very much what a great library is to the philologist. We may perhaps hope that what Peabody has done in founding a great reference library in Baltimore, which has freed the university trustees from the necessity of expending their income for that purpose, may some day be supplemented for the biologists through the endowment by some citizen of a natural history museum, the organization of which shall be entrusted to experts, so that,

while a source of recreation and instruction to the general public, it shall also be available for scientific work."

As an aid to the study of morphology, besides the facilities afforded in our biological rooms, a marine station for zoölogical research has been maintained upon the seaboard during the last five years. The only opportunities before provided for thorough study of marine zoölogy upon the thousands of miles of sea coast of the United States have been those afforded by the private laboratory of Mr. Alexander Agassiz at Newport, and that of the United States Fish Commissioners at Wood's Holl, under Professor Baird; and before the opening of the Chesapeake Zoölogical Laboratory, the founding of a marine laboratory for advanced research had not been attempted in this country by any educational institution. The director of the station is Dr. W. K. Brooks, assisted during a part of the time by Mr. S. F. Clarke, Ph. D., now professor of natural history in Williams College, and more recently by Mr. E. B. Wilson, Ph. D. The results of each summer's studies have been or will be printed in full, in the appropriate journals. Three of them are, however, so important as to deserve particular mention here. Dr. Brooks's memoir on the development of *Lucifer* was accepted by the Royal Society of London, and has just been published in a quarto volume of 80 pages, illustrated by

eleven plates. Dr. Wilson's memoir on *Renilla*, an elaborate monograph, likewise illustrated by numerous careful drawings, is now ready to be printed. Dr. Brooks's study of the *Oyster* has attracted very wide attention. He began this investigation from a point of view purely scientific, determined to observe and if possible to discover the laws which govern the reproduction of this mollusk. The results of his enquiry were printed in 1880, and widely distributed. His success was so remarkable that it was honored by a medal from the *Société d'acclimatation* in Paris, and has led to repeated requests that he would continue his investigation and endeavor to discover the causes which are rapidly destroying the oyster beds of the Chesapeake. With the hearty concurrence of the trustees, Dr. Brooks has accepted a place on the oyster commission appointed by the Governor of Maryland, and during the next few months, he will, with his colleagues, make further researches upon a question which is as interesting from an economic as a scientific point of view. Dr. Brooks has also rendered important scientific counsel in respect to the management of an aquarium to be established in Baltimore, by John W. Garrett, Esq., for public entertainment and instruction in natural history.

The rooms devoted to biological work have been from time to time increased, but the accommodations are still so inadequate that the trustees have

begun the construction of a new building to be entirely devoted to this study, and Dr. Martin has just returned from Europe, able to bring into service among us the latest suggestions of kindred institutions abroad. Liberal appropriations for the purchase of apparatus have always been made by the trustees. The collections of specimens are such as are needed by students among us.

Among the noteworthy discoveries which have been made in the biological laboratory may be mentioned that of a new method of studying the physiology of the mammalian heart, devised by Dr. Martin. By this method the heart of a warm blooded animal is kept alive after the death of all the rest of the creature; the direct influence of various conditions and of different drugs upon it can accordingly be studied with an accuracy previously quite unattainable, the influence of the nervous system and of other organs of the body upon the heart being eliminated. Hitherto, only the hearts of cold blooded animals have been available for physiological, pathological, and therapeutical study in this isolated condition; and for obvious reasons deductions as to the functions of the human heart, drawn from the study of the so different hearts of frogs and turtles, were open to many objections. Some first fruits of this inquiry have been communicated to the Medical and Chirurgical Faculty of Maryland, by Professor Martin, and by

his associates and scholars, Messrs. Sewall, Sedgwick, Howell, H. H., and F. Donaldson, and Warfield, and have been printed. Dr. Martin, recognizing the co-operation of his staff of adjuncts, proposed to call this important mode of inquiry the "Baltimore method." To utilise it in the thorough study of cardiac physiology will supply abundant work for many hands for several years, numerous problems which have hitherto been unattacked being now rendered available for investigation.

In addition to the papers published in the biological studies, attention should be called to a manual of human physiology, prepared by Dr. Martin, entitled "The Human Body"; to a hand-book of invertebrate zoölogy, prepared by Dr. Brooks for the scientific student at the sea-shore; and to a manual on the anatomy of one of the chelonia, (the slider-terrapin), by Dr. Martin and Dr. W. A. Moale, being the first part of a hand-book of vertebrate dissection, for use in biological laboratories. A school edition of "The Human Body" is now in type, as is also the second part (how to dissect a bird) of the hand-book of vertebrate dissection.

ANCIENT AND MODERN LANGUAGES.

As a leader in classical philology, Professor Gildersleeve was called here from the University of Virginia, where he had long been the professor of

Greek, and had acted for several years as professor of Latin. He declined to be responsible for the instruction in Latin, and concentrated his force upon Greek, with the purpose of giving to students, who propose to become teachers, and others, an opportunity to pursue their studies beyond the ordinary classical curriculum. At an early day he found it convenient to employ some of the methods which are used in the seminaries of German universities, and engage with his class in the prosecution of special inquiries bearing upon some central theme.

The work of the seminary in successive years has been as follows :

In 1878-79, the exercises included the analysis, exegesis, and criticism of selected tracts of Lucian, and the prosecution of researches into the language of Lucian and the life of the second century, such as Lucian's relation to Herodotus, the Ionism of the *Dea Syria* and the *De Astrologia*, the use of the optative in Lucian, Lucian and Diogenes Laertius, traditions as to the oriental origin of Greek philosophy, the worship of the Syrian Goddess, Lucian's attitude toward religion, and Lucian as a student of art.

In 1879-80, the centre of work was Aristophanes, and the play selected for special study was the *Wasps*. The members of the seminary were required to present in turn an exegetical and critical commentary of a portion of this comedy, and this work constituted a regular weekly exercise. In order to secure a wider knowledge of the author, cursory readings were also instituted in the other plays, which were in like manner assigned to certain students, charged with the duty of preparing the historical introduction and the analysis. In this way nearly all the members were made acquainted with the bulk of Aristophanes, and some of them followed besides a course of study in the fragments of the comic poets. Among the more elaborate papers, which were the fruit of this work in Aristophanes, may be mentioned the following : On the tropology of Aristophanes; on the genitive case in Aristophanes; on the infinitive in Aristophanes; on the distribution of the *choreutai* in the *Wasps*.

In 1880-81, the seminary was mainly engaged in the study of the Attic orators, especial attention being paid to the development of language and style and to the antique canons of æsthetic criticism. The members were required to furnish in turn exegetical and critical commentaries on select portions of the orators, to prepare historical introductions, to make analyses of speeches and abstracts of rhetorical treatises. Parts of Antiphon, Andokides, Lysias, Isokrates, Isaios, and Demosthenes were studied in this way, and some of the minor orations of the four last named were compared with one another in connection with the *iudicia* of Dionysios of Halikarnassos. Besides this general work, subjects of special study in the orators were assigned to individual members of the seminary and an effort was made to insure a personal acquaintance on the part of all the students with the works of all the orators of the Attic canon. Introductory lectures, informal examinations, and conferences were also held by the Director at suitable points in the course. Of the investigations which were carried on may be noted: Studies on the nominal periphrases for the verb in Antiphon and Thukydides; on the genuineness of the first Antiphontean oration; on synonyms in Antiphon; on the use of the locative formations, of *πρίν*, and of *ἐνί* in the orators; an elaborate statistic of certain syntactical characteristics of Andokides; an inquiry into the influence of technical rhetoric on the *ῥήεις* of the Attic drama. Special work was also done in Isaios, Lykurgos, and Deinarchos.

In 1881-82, the centre of work was Plato, chiefly with reference to the literary form. In the seminary proper, the *Euthydemos* and the *Theaitetos* were interpreted by the members in turn, with analyses and introductions and the *Symposion*, *Republic*, and *Protagoras* were analyzed. Papers were presented, read, and discussed on the *Euthyphron*, on the aim and result of the *Theaitetos*, on Dionysios' criticism of the style of Plato. Studies were made in Platonic syntax and on the relation between the discourses of Socrates in the *Symposion* and in the *Phaidros*. Some work growing out of the studies of the preceding seminary year was completed, such as an exhibit of the use of the so-called genitive absolute in the orators. A study on *ἐνί* in the orators, begun the preceding year, was extended to Homer and Plato, and in continuation of a line of syntactical investigations opened several years since by the director, statistics of the articular infinitive in Xenophon and Plato were prepared by members of the seminary. The results of some of these investigations will be prepared for publication. A survey of Homeric comparisons grew out of the consideration of the comparison in Plato, which was the theme of an earlier seminary essay. Professor Goodwin, of Harvard University, conducted the seminary for one meeting, in order to prepare the members for his presentation of the *Line* and the *Cave* in the *Republic*.

The establishment of the American Journal of Philology, under the editorial care of Professor

Gildersleeve, is mentioned in another place. His four courses of public lectures on Greek lyric poetry, on Homer's *Odyssey*, on Greek prose literature, and on the Greek tragic poets, were admirably adapted to awaken and keep up the love of classical literature among all who heard him.

The university is co-operating with several other institutions in the encouragement of Americans to engage in archæological investigations at Athens, under the auspices of the American Archæological Institute, Professor Goodwin being the present director.

In order that the classical instruction of undergraduate students might be carried forward in the most efficient way, the services were engaged of Professor Charles D. Morris, a graduate of the University of Oxford, and a former fellow of Oriol. He had already acquired a reputation in this country by his text-books, and by his remarkable success as a teacher. Upon him to a very large extent has devolved the instruction of matriculated students in the Latin and Greek classics. In this work assistance has been rendered in successive years by Mr. John M. Cross, of Baltimore, a graduate of Princeton, who also acted as registrar during our opening year, Mr. G. F. Nicolassen, Ph. D., and Mr. E. H. Spieker, Ph. D. Mr. J. F. Jameson, Ph. D., has been recently engaged to give instruction in classical history and geography.

The authors read in undergraduate classes have been these :

GREEK.		LATIN.	
Aeschylus.	Isocrates.	Catullus.	Persius.
Aristophanes.	Lyric Selections.	Cicero.	Plautus.
Aristotle.	Lysias.	Horace.	Pliny.
Demosthenes.	Plato.	Juvenal.	Quintilian.
Euripides.	Sophocles.	Livy.	Tacitus.
Herodotus.	Thucydides.	Lucretius.	Terence.
Homer.	Xenophon.		

In 1879, the university invited to its staff Mr. Minton Warren, a graduate of Tufts College, who had been resident in Germany for several years pursuing the study of Latin. Before coming to us he received the degree of Ph. D. from the University of Strassburg, having presented as his thesis, a paper on the enclitic *ne* in Early Latin. This appointment enabled the university to offer still further advantages for classical study. Dr. Warren has begun a Latin seminary, which was devoted, during the last winter, to the study of Virgil. The character of this work is indicated by the following paragraph :

A preliminary course of ten lectures was given on the ancient lives of Virgil, on the MSS., commentators, and scholia, and on Virgil's place in Roman literature. Occasional lectures were given during the year on various topics connected with Virgilian criticism. Special attention was paid to the syntax of Virgil and his influence upon subsequent writers, and to the development of the hexameter from Ennius down to Ovid. Some metrical statistics were collected by members of the seminary, and papers were read summing up recent views of Virgil's imitation of Greek poets, on his archaisms, and his value for the illustration of Roman antiquities. All of the Eclogues and Georgics were analyzed by the members in turn, and four of the Eclogues, the Episode of Aristaeus in Book IV of the Georgics, and portions of Books I, VI, and VIII, of the Aeneid were made the subject of critical interpretation.

Mr. C. R. Lanman, Ph. D., a former scholar of Professor Whitney, and subsequently a student of philology in Tübingen and Berlin, came to Baltimore as a fellow in 1876, and was soon promoted to the rank of an associate in Sanskrit. He gave instruction in this language and in comparative philology during three years, and was then called by the authorities of Harvard University to a corresponding professorship in Cambridge. While here, he was engaged in preparing an elaborate study on noun inflection in the Veda, which was printed by the American Oriental Society in a memoir of 276 octavo pages. After he resigned, the vacant position was offered to Mr. M. Bloomfield, Ph. D., who had been a pupil of Toy and Whitney, had resided for one year as a fellow in Baltimore, and had continued his studies in Germany. Dr. Bloomfield began his courses of instruction among us in 1881, and has already made several noteworthy contributions to philological science.

Instruction in the Semitic languages was given from 1876 to 1879 by Mr. Thomas C. Murray, who had prepared himself for this work by his studies under Ewald and Lagarde. After his death, some instruction in Hebrew was given by Mr. J. M. Cross, and at a later day Dr. Bloomfield consented temporarily to take charge of the class.

The instruction in German was given from 1876 to 1882 by Mr. H. C. G. Brandt, who has just resigned his position as an associate, to become, after a year's residence in Europe, professor of modern languages in Hamilton College, where he graduated and began his professional career. Mr. Brandt has not only been an efficient teacher of modern German, but he has encouraged the study of Teutonic philology by teaching Gothic, Old High German, and Middle High German. His resignation occasions much regret. Fortunately, Dr. Wood is able to assume the duties of Mr. Brandt, and consents to do so temporarily, with the promised co-operation of Professor Raddatz and Dr. J. W. Bright. Dr. W. H. Browne, our librarian, will relieve Dr. Wood of a part of his duties in the English department, and Dr. W. H. Carpenter will give a short course of lectures on Icelandic literature. These arrangements will enable the trustees to take a sufficient amount of time to determine upon a permanent appointment.

Mr. A. M. Elliott, a graduate of Harvard College, and a philological student for many years in Munich, has been since 1876 an associate in Romance philology, and has given lectures and conducted seminary exercises in Provençal, Old French, and the related languages and dialects of southern Europe. He was unfortunately prevented by a serious illness from resuming his duties at

the beginning of this term, but his early recovery and return are confidently anticipated. M. Rabilon, well known in Baltimore for his literary acquisitions and culture, has lectured annually in French upon classical authors and upon interesting periods in the literary history of France. The minor courses in French have been given during the past two years by Mr. P. B. Marcou, a graduate of Harvard, to whom both French and English have been from his earliest life familiar tongues. He still continues to be in charge of the introductory classes in French.

The authorities of the university have been desirous of giving special prominence to the study of the English language and literature, and three distinguished scholars of wide reputation have successively been invited to come here as professors. Two of them were Englishmen, who would not consent to cross the ocean, and the third was so strongly attached to his home in Cambridge that he could not be drawn away from it. The one last referred to, Professor Child, consented to lecture here in two successive winters. The impulse which he gave to the study of Early English by his courses on Chaucer and on ballads, and the pleasure derived from his interpretation of Shakespeare, are still gratefully remembered. The chief instruction in English philology has been given by younger men—first by Mr. A. S. Cook, Ph. D., now professor

of English in the University of California, and then by Mr. Henry Wood, Ph. D., still associate in English. Both these gentlemen have prosecuted their studies under able German teachers in Teutonic, and especially in English philology, the last named proceeding to a degree in Leipsic, the other in Jena. In connection with this branch of study, some attention has been given by other teachers to practical exercises in writing English, and to vocal culture by Mr. C. L. Woodworth.

During two years, lectures were given on English literature by Mr. Sidney Lanier, and we were anticipating continued co-operation from him; but the career of this gifted man was closed by death in the summer of 1881. A few of his friends in Baltimore, Boston, Atlanta, and other places, united in presenting to his widow a substantial testimonial of their appreciation of his character and works.

HISTORY AND POLITICAL SCIENCE.

Systematic instruction in history, (especially American,) has been given since 1876 by Mr. Austin Scott, Ph. D., of Washington; but his engagements with Mr. Bancroft, the historian, prevented him from giving his full time to our students, and the duties of an associate in history have devolved upon Mr. Herbert B. Adams, Ph. D., an Amherst graduate, who prosecuted his higher studies under

Bluntschli, at Heidelberg. A pleasing and substantial recognition of his relation to this distinguished jurist, who with Laboulaye and Lieber, have been called an international trifolium, has been made by the German citizens of Baltimore, who are about to present to the Johns Hopkins University the library of Bluntschli. It will be placed, with other works in historical and political science, in a convenient room which has been opened for the use of the seminary students in this department.

Political economy was taught during the years 1879-81 by Mr. H. C. Adams, Ph. D., now professor in the University of Michigan and lecturer in Cornell University, and during the year 1881-2 by Mr. Richard T. Ely, who now holds the position of an associate. Dr. Ely, after graduating in Columbia College, was a student in Heidelberg, where he was advanced to the degree of Ph. D.

In addition to the regular class instructions in history and political science from the persons already named, special courses have been given from time to time by non-resident lecturers. Our students have had the opportunity to hear Dr. H. von Holst, of the University of Freiburg, author of a constitutional history of the United States; Mr. E. A. Freeman, D. C. L., the historian of the Norman conquest; Mr. James Bryce, D. C. L.,

a regius professor in the University of Oxford, author of a work on the Holy Roman Empire; the greatly to be lamented Professor Diman, of Providence; Chief Justice Cooley, of Michigan; Gen. F. A. Walker, superintendent of the U. S. census; Professor Venable, of the law department of the University of Maryland; Prof. W. F. Allen, of the University of Wisconsin; Hon. J. J. Knox, comptroller of the currency; and Dr. H. C. Adams, now of the University of Michigan. It is not surprising to find that the young men among us have been greatly stimulated by these courses of lectures, and are themselves disposed to take up careful and prolonged inquiries upon important subjects suggested by their studies. Dr. H. B. Adams has led them to a series of interesting investigations upon the origin of American institutions. Aided by the various historical societies of this country, (especially our own, the Maryland Historical Society,) and availing himself of the local interests of a company of students drawn from widely separated parts of this country, he has secured from these pupils a valuable series of historical monographs which are about to be published under his editorial supervision. Mr. Freeman has written an introduction to this series. Four papers by Dr. Adams will first be printed, and then will come a series of essays, by the members of the seminary, on local government in the older States.

LOGIC, ETHICS, AND HISTORY OF PHILOSOPHY.

It has been from no want of interest in philosophical studies, that we have been delayed in making permanent arrangements in regard to them; but the scheme of lectures as now arranged offers some noteworthy opportunities.

Professor George S. Morris, Ph. D., who has spent a portion of every year among us since 1878, continues to lecture on the history of philosophy and on ethics. The fruit of his call to a congenial work may be seen not only in his own published volumes, but also in the series of philosophical studies which he is editing, beginning with his own study of Kant's *Kritik*, which was given to his students in this university in the course of last winter. ✓

Mr. Charles S. Peirce, who has been for a long period a close student of the processes employed in various branches of physical investigation, and who is a proficient in more than one department of science, now offers to our students instruction in logic, or the method of methods, particularly for the benefit of those who are expecting to be engaged in investigation and who need fundamental guidance in the principles which underlie the discovery of scientific truth.

Several papers written by his followers in preceding years, with one of his own numerous

memoirs, hitherto unprinted, have been sent to the press and will soon be published. His rare collection of works upon logic, particularly rich in scholastic philosophy, has been acquired partly by purchase and partly by Mr. Peirce's generous gift.

Professor G. Stanley Hall, Ph. D., will hereafter direct our students in psychology, a service for which he has become fitted by his historical studies, by prolonged work in the laboratories of Leipsic and Berlin, and by varied experience as a lecturer in Harvard, Williams, and other colleges. Dr. Hall is desirous of awakening the attention of our students, particularly of those who expect to become teachers, to the importance of scientific pedagogics, and will doubtless offer some definite instruction in this subject.

EXAMINATIONS AND DEGREES.

Our staff of instructors is desirous of maintaining the best possible system of examinations, so that the degrees we confer and the certificates we give may be everywhere recognised as meaning what they say. There is danger on the one hand, where it is assumed that the instructor will be strict, that a knowledge on the part of his pupils of his ways and favourite points may lead to "cramming" to meet these points, and so the examination may appear to be of a rigid and

minute character, and yet may tell very little about the real acquisitions of the class; and on the other, where the instructor is known to be good natured, that the examination will be so slight that slipping through will be easy. But more than this, there is the natural infirmity of all persons, even the most conscientious, to be guarded against—that, namely, of a disinclination to see short-comings in the work of their own hands. When an instructor has had students under his charge for a year, he will be naturally reluctant, except in cases of exceptional or total failure, to certify that they have, after all, but a slender acquaintance with the subject they have been learning. It may very well be the case that this supposed failure on the part of the students examined may be entirely due to their own incompetence or carelessness; but the instructor can hardly help feeling that it may be otherwise interpreted, and accordingly his natural and probably unconscious leaning must be rather to pass as large a number of his class as possible, than to maintain the ideal standard of excellence which he probably had in his mind when he began to read the papers.

The only sure way of guarding against all these tendencies to bring down the character of examinations from the ideal standard is, as it seems to most of us, the employment of paid experts to act as coadjutors with the regular teachers in the work of examination. Each instructor in our under-

graduate classes is now encouraged to test, in his own way, the proficiency of his students, at frequent intervals during the session ; and the result of this examination is recorded at the registrar's office at least twice in every academic year. The university, as a body, will hold one examination, instead of two as heretofore, of all candidates for the bachelor's degree, and will enlist, as far as practicable, for this service those who have not been teachers of the students to be examined. This plan has already been the regular usage in respect to the classes in Greek, Latin, German, and French—and is believed to be applicable elsewhere. We have received valued co-operation from Professors Maupin and Raddatz, of the city college, and from other non-resident professors.

In like manner, candidates for the second degree, (doctor of philosophy,) have in all cases been examined by the entire staff of professors, and often by some of the associates, and quite frequently by scholars of distinction holding chairs in other colleges and universities.

The effect of these regulations is to hold before the younger and the older candidates perpetually the notion that their attainments are to be judged by those who are strangers to them, and that their standing depends on the knowledge they show of a subject, rather than on their familiarity with a text book. As a means of intellectual discipline,

testing at intervals all the faculties of a student, his accuracy, his discrimination, his judgment, his memory, and his range, nothing better has been devised.

Each candidate for the bachelor's degree has been required to pursue during his undergraduate career, at least five courses of study, two of them, called major courses, implying that, by a two years' course, he has become proficient in each subject, and three other, minor courses, each of which he has studied for at least a year. An additional course, known as the composite minor, consisting of lectures and exercises in ethics, history, and English, and equivalent, as a whole, to one of the other minor courses, has been recently arranged. This will hereafter be required, in addition to the three other minor courses, from all candidates for the bachelor's degree.

The preference of courses shown by the forty-six persons who have taken the bachelor's degree, during the last four years, is exhibited by the following table:

	Major Courses.	Minor Courses.		Major Courses.	Minor Courses.
Latin,	21	9	Biology,	6	1
German,	17	27	French,	2	27
Greek,	12	5	Philosophy,	1	8
Chemistry,	11	10	English,		5
History,	10	12	Logic,		1
Mathematics,	7	8	Mineralogy,		1
Physics,	6	80			

The number of undergraduates who have come forward to the baccalaureate degree, during the

year, is fifteen, making the whole number of bachelors of arts, here created in four years, forty-six. The names of those graduating in 1881-82, are as follows :

William H. Adkins, Easton.	Gustav A. Liebig, Jr., Baltimore.
T. Alexis Berry, Baltimore.	C. W. Emil Miller, Baltimore.
Gustav Bissing, Baltimore.	James Page, Baltimore.
Walter B. Clarkson, Baltimore.	Albert G. Palmer, Baltimore.
Hermann L. Ebeling, Catonsville.	Robert M. Reese, Baltimore.
Louis Garthe, Baltimore.	Lewis T. Stevens, Baltimore.
Edward Ingle, Baltimore.	Herbert T. Tiffany, Baltimore
Richard F. Kimball, Baltimore.	

Nine candidates who had presented the requisite theses and had also passed the examinations successfully, were made doctors of philosophy. The whole number of persons admitted among us to this second degree is thirty-three. Nearly all of these are looking forward to the profession of teaching as a career in life; twenty-nine of them have already received appointments in colleges and other educational establishments.

The names of the doctors of philosophy (1881-82) and the titles of their theses are as follows :

James W. Bright, of Lock Haven, Pa., A. B., Lafayette College, 1877, and A. M., 1880. His principal study was the Teutonic languages, the subordinate, Sanskrit. He submitted a thesis entitled "A Discussion of the Verbal forms in King Alfred's West-Saxon Version of Gregory's *Cura Pastoralis*."

J. Franklin Jameson, of Amherst, Mass., A. B., Amherst College, 1879. His principal study was history, the subordinate, political economy. His thesis on "The Origin and Development of the Municipal Government of New York City," is in course of publication in the *Magazine of American History*.

Mitsuru Kuhara, Tsuyama, Japan, S. B., University of Tokio, 1877. His principal study was chemistry, the subordinate, mineralogy. His thesis on the "Oxidation of Nitrometaxylene," has been published, in modified form, in the *American Chemical Journal*.

Robert W. Mahon, of Baltimore, C. E., Lehigh University, 1876. His principal subject was chemistry, his subordinate, physics. His thesis on "Some Investigations on the Benzyl-derivatives of the Sulphamides of Metaxylene," has been published in modified form, in the *American Chemical Journal*.

Oscar H. Mitchell, of Marietta, Ohio, A. B., Marietta College, 1875, and A. M., 1878. His principal subject was mathematics, the subordinate, logic. His thesis, entitled "Some Theorems in Numbers, with a Generalization of Fermat's and Wilson's Theorems," has been published in the *American Journal of Mathematics*.

George F. Nicolassen, of Baltimore, A. B., University of Virginia, 1879, and A. M., 1880. His principal subject was Greek, the subordinate, Latin. His thesis on "The Articular Infinitive in Xenophon," will be prepared for publication.

William A. Noyes, of Grinnell, Iowa, A. B., Iowa College, 1879. His principal subject was chemistry, the subordinate, physics. His thesis "On the Protection from Oxidation of a Group containing two Carbon-Atoms," has been published, in modified form, in the *American Chemical Journal*.

Chase Palmer, of Baltimore, A. B., Johns Hopkins University, 1879. His principal subject was chemistry, the subordinate, mineralogy. His thesis "On the Sulphocinnamic Acids," has appeared, in modified form, in the *American Chemical Journal*.

Edward H. Spieker, of Baltimore, A. B., Johns Hopkins University, 1879. His principal subject was Greek, the subordinate subjects, Latin, Sanskrit, and Hebrew. His thesis "On the so-called Genitive Absolute and its use, especially in the Attic Orators," will be prepared for publication.

FELLOWSHIPS AND SCHOLARSHIPS.

The system of fellowships which has been adopted here, has been most fruitful in good results, as may readily be discovered from a scrutiny of the roll of fellows, and by reference to the bibliography which is printed in the appendix. If any proof of the value of the system is needed beyond our own experience, it may be found in the fact that its essential features have been followed in two foreign universities, and are now reported

to be under consideration in a third. A statement of the scheme of fellowships and of the rules under which they are awarded is made in the appendix.

The founder of the university provided for the establishment of certain scholarships. His language upon this subject is as follows:

"And I further request the trustees of the said university to establish from time to time, such number of free scholarships in the said university as may be judicious, and to distribute the said scholarships amongst such candidates from the States of Maryland, Virginia, and North Carolina, as may be most deserving of choice, because of their character and intellectual promise; and to educate the young men, so chosen, free of charge."

Twenty such scholarships, known as Hopkins Scholarships, freeing the holders from charges for tuition, were offered at the commencement of the university to young men who needed this assistance, and more have been since annually awarded. No publicity has been given to the names of those appointed. During the past six years, seventy young men from the States designated have received the benefit of this provision.

By a contribution from the president and professors, two graduate scholarships, of two hundred and fifty dollars each, were bestowed during the year 1879-80; and during each of the two following years, ten graduate scholarships of the same value have been bestowed from the university income upon students who gave special evidence to the faculty of exceptional merit in the prosecution of their studies.

A scholarship, yielding three hundred and fifty dollars, contributed by two friends of the university, was also awarded in 1880 for the encouragement of special study in philosophical subjects. Of the sum above named, \$250 were given by Mr. Allan Marquand, and \$100 were added by one of the trustees, for the further encouragement of the chosen recipient.

To show his interest in the Baltimore City College, an officer of the university has given, for three years, a premium of one hundred dollars to that graduate of the city college who passed the best matriculation examination on his admission to the university. Although the persons who have received this prize are in all respects excellent and promising students, its general influence has not been sufficiently marked to encourage a renewal of the offer.

UNIVERSITY SOCIETIES, ETC.

Several associations, composed of members of the faculty and advanced students, meet regularly for the presentation and discussion of original papers. The circulars contain abstracts of the more important communications. There are also reading clubs for the regular examination of the scientific periodicals which are received in such abundance.

These societies are :

1. The Scientific Association, meeting under the presidency of Professor Sylvester.
2. The Philological Association, meeting under the presidency of Professor Gildersleeve.
3. The Mathematical Society, meeting under the presidency of Professor Sylvester.
4. The Historical Association, of which Dr. H. B. Adams is the secretary.
5. The Metaphysical Club, of which Professor C. S. Peirce is the head.
6. A Naturalists' Field Club, organized under the leadership of Professor Martin.

Reading clubs are organized in :

Chemistry, under Professor Remsen and Dr. Morse.

Biology, under Professor Martin and Dr. Brooks.

Physics, under Professor Rowland and Dr. Hastings.

THE LIBRARY.

It has been found of so great advantage that those members of the university who are engaged in original research or other advanced work, shall have at hand those books which are needed in their studies or investigations, that there is at present a growing tendency in the library department to develop in the direction of special libraries auxiliary to the leading branches of study, and placed in the rooms where those studies are carried on. The nuclei of such special libraries have already been formed in the departments of Greek, chemistry, history, political economy, and education ; and it seems probable that other departments will, in the course of time, adopt this plan, leaving the main collection to assume more and more the character of a library of general reference.

The close association of those following similar researches, and animated by the same zeal, is an active stimulus and a great help to work ; and this is still further assisted by placing those books which are most likely to be needed, or which specially bear upon the work, within easy reach of the worker's hand.

The library now includes 13,200 bound volumes, purchased at a cost of \$38,000. It is open daily for thirteen hours, and comprises :

A collection of books for general reference, including not only cyclopædias and dictionaries, but copies of the works of great authors, ancient and modern, in different branches of literature and science ;

Special collections of books which have been bought as the working apparatus of the chief departments of study, from lists which have been furnished by the several instructors, and which are placed either in the main library, or in the special libraries above referred to ;

A transient collection of new books, English, French, and German, brought here for examination as soon as published, sometimes by purchase, and sometimes by the courtesy of dealers ;

A collection of scientific and literary periodicals, now numbering three hundred and thirty-eight. This list is supplemented by those of the Peabody Institute and other institutions of the city, so that

the whole number of journals accessible to students (exclusive of ephemeral publications) exceeds seven hundred. They pertain to all departments of knowledge and come from all parts of the globe.

I would here call attention to the very useful as well as beautiful system on which the libraries of Baltimore have been planted and are growing.

In the first place, there is the Peabody Library, a great storehouse of reference works, well arranged in a noble building, thoroughly catalogued and indexed, accessible to all students from 9 a. m. to 9 p. m., without charge.

Next, there are the collections of the Johns Hopkins University. These are the books of the laboratory and the seminary, that is to say, special libraries formed by specialists for special purposes, and distributed accordingly in many different apartments where they may be most readily reached by those who wish to work with them.

These collections are soon to be supplemented by the Enoch Pratt Free Library. This is a library for circulation, where books may not only be read, but where they may be also borrowed for home reading. Its use will be open to all, without charge.

Near by is a social library, the Mercantile, which has recently been provided with excellent quarters, by the enlightened policy of its president; a place where the current magazines and journals as well as popular books may readily be seen.

There is also the remarkable collection of the Maryland Historical Society, rich in Americana, and especially in manuscripts, pamphlets, and books pertaining to Maryland and the adjacent region.

There are also three professional libraries, that of the Baltimore Bar, and of the Medical and Chirurgical Faculty, maintained by the legal and medical men of the city, and the Stinnecke collection in ecclesiastical history and theology, founded by Bishop Whittingham.

The city has also its important collections of municipal documents in the city hall.

It thus appears that according to his needs the student may have access to a storehouse of books, a literary laboratory, a circulating library, and to the special apparatus of the historian, the civic officer, the physician, the jurist, and the theologian. All these collections are included within a circle of a half-mile radius, in the centre of which stands the Enoch Pratt Free Library, like a central fountain for popular resort. Is not Baltimore in its library policy an example to other cities?

The number of bound volumes in the principal libraries of the city is :

Peabody Library,	77,000
Mercantile Library,	87,700
Maryland Historical Society,	22,000
Johns Hopkins University,	13,200
Bar Library,	8,800
Medical and Chirurgical Library,	8,300
Whittingham Library,	17,000
	<hr/>
	179,000

The principal libraries of Washington, which are readily accessible to our students, include the Library of Congress, with 650,000 books and pamphlets; that of the Surgeon General's Office, with 120,000; that of the Bureau of Education, with 50,000; as well as those of the various administrative bureaus and scientific departments of the government.

PUBLIC LECTURES.

Our system of public lectures is now, I think, generally understood, but it may interest even those who are most familiar with them, to look back and see how many courses have been given within the last six years, and how many eminent men from a distance have been among us. These lectures are chiefly designed to be supplementary to our regular classes. Attendance upon them is voluntary, and no credit is given on our books for being present, but the brighter young men are quick enough to discover what excellent opportunities are afforded in these courses for the acquisition of knowledge, and they need no other encouragement to attend. Incidentally the university receives much benefit from the frequent presence of strangers among us, and more than one of our advanced scholars attributes his subsequent career to the acquaintance formed in our hall with professors from other institutions.

The public have been admitted to these lectures as freely as was possible in the very limited space at command. When there has been a demand for more cards of admission than there were sittings, invitations have been given first to those who were known to us as special students of the subject of the lecture, and next to those who were engaged in teaching. The audiences have thus been made up almost wholly of those who could enjoy and profit by academic instruction.

The following table shows the names of the lecturers, their subjects, the number of lectures given, and the average attendance for each course, according to the door-keeper's count. Some lectures, as those by Professor Cayley on mathematical subjects, and those by Mr. C. S. Peirce on mathematical logic, are not included in the statement, because they were not intended for any but special scholars.

Subject.	Lecturer.	Average Attendance.
National Debts, (9),	H. C. Adams,	41
Religion and Government in the Ancient World, (2),	H. B. Adams,	19
Beginnings of Church and State, (10),	H. B. Adams,	88
Italian Renaissance, (10),	H. B. Adams,	212
Teutons in Church and State, (5),	H. B. Adams,	212
Internationalism, (5),	H. B. Adams,	193
History of the Fourteenth Century, (20),	W. F. Allen,	96
Photophone and Spectrophone, (1),	A. Graham Bell,	235
History of Medicine, etc., (20),	J. S. Billings,	49
German Literature prior to the Classical Period, (9),	H. C. G. Brandt,	42
Theories of Biology, (16),	W. K. Brooks,	80
Recent Studies of the Crab and the Oyster, (3),	W. K. Brooks,	78

Subject.	Lecturer.	Average Attendance.
Recent Political Discussions in England, (6),	J. Bryce,	169
Chaucer, (20),	F. J. Child,	191
Ballads of England and Scotland, (20), . .	F. J. Child,	187
Shakespeare's Plays: Hamlet, Macbeth, (10),	F. J. Child,	195
Early England, (6),	A. S. Cook,	196
Torts, (20),	T. M. Cooley,	87
Recent Amendments to the Constitution of the United States, (6),	T. M. Cooley,	108
Evils in Local Government, (6),	T. M. Cooley,	87
The New Testament, (10),	J. M. Cross,	12
Thirty Years' War, (20),	J. L. Diman,	192
Dante, (10),	A. M. Elliott,	152
The Civil Service, with special reference to that of Prussia, (4),	R. T. Ely,	68
Selected Botanical Subjects, (6),	W. G. Farlow,	89
Historical Geography of South-eastern Europe, etc., (6),	E. A. Freeman,	91
Greek Lyric Poetry, (20),	B. L. Gildersleeve,	42
Homer's Odyssey, (20),	B. L. Gildersleeve,	158
Introductory to Greek Prose Literature, (12),	B. L. Gildersleeve,	80
Greek Tragic Poets, (9),	B. L. Gildersleeve,	114
Republic of Plato, (8),	W. W. Goodwin,	152
Psychology, (10),	G. S. Hall,	190
Clear Thinking and its Best Modern Methods, (5),	G. B. Halsted,	61
Theory of Sound in its Relation to Music, (6),	C. S. Hastings,	162
Light, (4),	C. S. Hastings,	208
Territorial Surveys, (20),	J. E. Hilgard,	21
The Senses and the Brain and their Relation to Thought, (10),	W. James,	62
Banking Systems of the United States, (8),	J. J. Knox,	175
Sun and Radiant Energy, (6),	S. P. Langley,	207
English Verse, (16),	Sidney Lanier,	170
English Literature, (12),	Sidney Lanier,	195
The Vedas, (6),	C. R. Lanman,	151
Early French and Italian Literature, (20),	J. R. Lowell,	179
Waste Products of Chemical Manufacture, (20),	J. W. Mallet,	29
History of the Chief Branches of Chemical Industry, (20),	J. W. Mallet,	45
General Biology, (20),	H. N. Martin,	66

Subject.	Lecturer.	Average Attendance.
The Human Body, (4),	H. N. Martin,	249
The Political Situation in Eastern Europe, (4),	D. McG. Means,	70
Political Economy in the United States, (4),	D. McG. Means,	15
Theory of Development, (7),	J. McCrady,	197
General History of Philosophy, (20),	G. S. Morris,	124
Topics in Ethics, (14),	G. S. Morris,	128
British Thought and Thinkers, (12),	G. S. Morris,	128
History of German Philosophy, (6),	G. S. Morris,	148
The Hebrew Scriptures, (9),	T. C. Murray,	41
History of Astronomy, (20),	S. Newcomb,	50
History of the Formation of the French Language (<i>in French</i>), (19),	L. Rabillon,	20
History and Evolution of the French Language (<i>in French</i>), (20),	L. Rabillon,	48
French Romantic Literature (<i>in French</i>), (11),	L. Rabillon,	85
French Epic Poetry (<i>in French</i>), (12),	L. Rabillon,	57
Readings in Corneille, Molière, etc. (<i>in French</i>), (12),	L. Rabillon,	47
Satirists of France (<i>in French</i>), (12),	L. Rabillon,	58
French Poetry, etc. (<i>in French</i>), (10),	L. Rabillon,	56
French Literature (two courses) (<i>in French</i>), (24),	L. Rabillon,	48
History of Chemistry, (12),	I. Remsen,	111
Selected Topics in Chemistry, (4),	I. Remsen,	229
Conservation of Energy, (4),	H. A. Rowland,	188
Studies on the "Return to Kant," (5),	J. Royce,	18
Poetry of the German Romantic School, (8),	J. Royce,	88
Cyprus and Mycenae, (8),	A. D. Savage,	81
English History, (12),	A. Scott,	87
Development of the U. S. Constitution, (10),	A. Scott,	99
Greece in the Fifth Century, B. C., (10),	E. G. Sihler,	89
Attic Life and Society, (8),	E. G. Sihler,	80
Laws of Verse, (1),	J. J. Sylvester,	235
Philosophy of Physics, (12),	J. Trowbridge,	142
Constitutional Law, (12),	R. M. Venable,	108
The German Empire, (10),	H. von Holst,	258
Money, (20),	F. A. Walker,	49
Finance, (21),	F. A. Walker,	44
Historical Development of the Infective Structure of the Indo-European Languages, (18),	W. D. Whitney,	84

Special courses of lectures and demonstrations in respect to the recent progress of physiology, have been given to medical men by Professor Martin, Dr. Sewall, etc.

An effort has also been made to be of service to the teachers of Baltimore, not only by admitting them to public lectures, but also by establishing special Saturday classes for their benefit. The following courses, to which teachers only were admitted, have been given :

1. On Physiology, by Professor Martin, twenty lectures, accompanied by practical instruction in twenty weekly exercises, in the biological laboratory.
2. On Elementary Zoölogy, by Dr. Brooks, fifteen lectures and forty-five hours of connected work in the biological laboratory.
3. On the theory of Numbers, by Dr. W. E. Story, ten lectures.
4. On improved methods of beginning the study of Latin, twenty exercises by Professor C. D. Morris.
5. On Early English, by Mr. A. S. Cook, twelve lectures on the basis of a simple Anglo-Saxon text.

The attendance at all these lectures was as punctual and regular as if a degree depended on it, and at the close of each course there was a grateful recognition on the part of the class, of the benefits they had received.

Many of the instructors have also lectured by invitation before associations in different parts of the city and in its neighborhood. This is no part of the official work of our staff and no report is made of it, but it has pleased me, and I am sure it will please others, to notice in how many local

institutions the officers of the university have, by invitation, delivered lectures or addresses.

University of Maryland (Medical Faculty.)
 Medical and Chirurgical Faculty of Maryland.
 Peabody Institute.
 Maryland Institute.
 McDonogh Institute.
 Canton Institute.
 Woodberry Institute.
 Baltimore and Ohio employees.
 St. Peter's Brotherhood.
 St. Michael's Guild.

Maryland Historical Society.
 Maryland Academy of Sciences.
 Young Men's Christian Association.
 State Normal School.
 Baltimore County Teachers' Association.
 Baltimore City Teachers' Association.
 Educational Conference of Friends.
 Various private schools.
 Etc., etc.

It would be much more difficult for me to give an idea of the charitable and benevolent services in which the members of the university take part, but I may mention as particularly good the instructions of some of our young men on Sundays among the inmates of the penitentiary and in various mission schools.

PUBLICATIONS.

As soon as the academic staff of the university came together, it was obvious that means should be provided for the publication of their scientific and literary papers. The want was first felt in the department of mathematics. It was suggested to Professor Sylvester that he should ask his colleagues in the *London Journal of Mathematics* to transfer its publication to Baltimore, but on further consideration it appeared that the mathematicians

of this country were agreed in desiring to see an American periodical devoted to the most advanced investigations in this science. A large number of letters were received from college professors and from the mathematicians in the government service commending a plan submitted to them for the publication of such a journal. The trustees having promised their pecuniary aid, the first number of the American Journal of Mathematics was published in quarto form in 1878. Four volumes have since been issued, and there appears to be no want of material for its continuance. Dr. Story, Dr. Franklin, and Dr. Craig have successively given their assistance to the editor, Professor Sylvester, in the conduct of the journal.

The work of the chemists next came under consideration. Such papers as they had to offer were too extended to be printed in the American Journal of Science, and it was inconvenient to continue sending them to Germany; and so, after various propositions had been duly weighed, the determination was reached to publish in Baltimore the American Chemical Journal, to be edited by Professor Remsen. The trustees promised their assistance, and three annual volumes have now appeared, containing contributions from the principal chemical laboratories of this country. The issue began in April, 1879.

To promote the study of language, Professor Gildersleeve was led to begin the American

Journal of Philology, encouraged partly by the numerous promises of co-operation received from widely separated philological students, and partly by the assurance that his effort would be sustained to a certain extent by the university. The first number appeared in February, 1880, and the third volume is now in progress.

The biological papers have been printed in various forms. Some were contributed to the Journal of Physiology; some were printed at the expense of a few generous friends of the university; and others at the cost of the Johns Hopkins fund. They have been collected under the editorial supervision of Professor Martin and Dr. Brooks, with the title of Studies from the Biological Laboratory. Unlike the publications already referred to, these papers are only by members of our own staff, the teachers and students of biology.

The volume of Contributions to Logic now in press, under the editorial care of Mr. C. S. Peirce, will contain papers with the following titles:

The logic of the Epicureans, by Allan Marquand.

On the algebra of logic, by Miss Ladd.

On the algebra of logic, by O. H. Mitchell.

On relative numbers, by B. I. Gilman.

On probable inference, by C. S. Peirce.

The early numbers of the Studies in Historical and Political Science, edited by Dr. H. B. Adams, will include the following papers:

Introduction to American institutional history, by E. A. Freeman.

The Germanic origin of New England towns, by H. B. Adams.

- Saxon tithingmen in America, by H. B. Adams.
 Norman constables in America, by H. B. Adams.
 Village communities in America,—Cape Ann and Salem plantations, by H. B. Adams.
 Local government in Illinois, by Albert Shaw.
 Local government in Pennsylvania, by E. R. L. Gould.
 Origin and development of the municipal government of New York City, by J. F. Jameson.
 Administration of Berlin compared with that of New York, by R. T. Ely.
 Local self-government in South Carolina, etc., by B. J. Ramage.
 Local institutions of Ohio—Indian, French, and English, by John T. Short and S. C. Derby.
 Local government of Michigan and the North-west, by E. W. Bemis.
 French and English institutions of Wisconsin, by W. F. Allen.
 Civil government in Iowa, by Jesse Macy.
 Old town institutions of Maryland, by L. W. Wilhelm.
 Old Maryland manors, by John Johnson.
 Parish institutions of Maryland, by E. Ingle.
 Free schools in Maryland, by Basil Sollers and L. W. Wilhelm.
 The institutions of North Carolina, by Henry E. Shepherd.
 Montauk and the common lands of Easthampton, Long Island, by J. F. Jameson.

Since the opening in 1876, it has been found convenient to issue frequent statements in respect to the development of our plans. The earliest of these official circulars were printed in octavo. Nearly three years ago the form was changed to a quarto, and some of the features of the University Reporter of Cambridge, England, were introduced, particularly current announcements of lectures and courses of instruction. These bulletins were originally designed for the information of those who were connected with this university, or who wished to enter it; but they soon proved to be a convenient channel for acquainting the public at large with the condition of the foundation, and for spread-

ing information in respect to scientific and literary investigations which were here in progress. Gradually the reports of society meetings, and the synopses of scientific papers claimed more and more space, and a demand for the successive circulars was indicated far beyond the company for which the original publication had been designed; and even to a limited extent in foreign countries.

It is now thought best to modify in some particulars the plan of the circulars, so as to give still more space to the original work of the professors in the university and their more advanced students, without omitting the current information in respect to the plans of instruction, the rolls of attendance, and other purely local matters.

Our publications are offered to subscribers, and are also the basis of important exchanges with foreign institutions and journals, as well as with many in this country.

CONCLUSION.

Such is the report which may be made to the trustees, and through them to the public, of the beginnings of the Johns Hopkins University. No one knows better than those who are engaged in its service, how many circumstances have favored this institution. Large funds bestowed by a large-minded benefactor; carefully drawn and wisely

considered instruments by which the corporation was organized; trustees who had no personal ends to promote, but were eager to secure the best possible results and were liberal and co-operative in all their official actions; able teachers thoroughly interested in their work; citizens watching with the closest scrutiny and with encouraging words all our announcements; neighboring foundations, (in several of which the Hopkins trustees were enlisted), ready to lend a helping hand; newspapers whose columns have been open to the record of every progressive step; and moreover, students of talent and industry eager to avail themselves of the opportunities here afforded; these have been the factors of our brief history.

There is still much to be done. Near at hand must be the initiation of a department of medicine. Other important subjects, hitherto passed by, must soon receive attention. I will not now dwell upon these points. I will only add my personal acknowledgments to the governing bodies, the trustees and teachers, for their considerate counsel and generous co-operation during the past six years, and especially for their kindness and helpfulness during the last year when, by reason of ill-health, I was so long prevented from discharging my usual duties. I am reminded that four of the twelve trustees who organized this university, are no longer members of the board. Let me renew an expres-

sion of my obligations to one who is deceased, to Galloway Cheston, a friend of the founder, and first president of the trustees, whose wisdom, moderation, and farsightedness have helped to lay firmly the foundations on which we are building.

DANIEL C. GILMAN,

President of the Johns Hopkins University.

BALTIMORE, October 2, 1882.

APPENDIX.

A.

Academic Staff, 1876-82.*

PRESIDENT.

	Appointed.
DANIEL C. GILMAN,	December 30, 1874.

PROFESSORS.

	Appointed.
BASIL L. GILDERSLEEVE, <i>Greek</i> ,	1876.
J. J. SYLVESTER, . . . <i>Mathematics</i> ,	1876.
IRA REMSEN, . . . <i>Chemistry</i> ,	1876.
HENRY A. ROWLAND, . . . <i>Physics</i> ,	1876.
H. NEWELL MARTIN, . . . <i>Biology</i> ,	1876.
CHARLES D. MORRIS, . . . <i>Classics</i> ,	1876.

ASSOCIATES.

	Years of Service.
JOHN M. CROSS, . . . <i>Greek</i> ,	1876-1881.
PHILIP R. UHLER, . . . <i>Natural History</i> ,	1876-
AUSTIN SCOTT, . . . <i>History</i> ,	1876-1882.
A. MARSHALL ELLIOTT, . . . <i>Romance Philology</i> ,	1876-
THOMAS C. MURRAY, . . . <i>Shemitic</i> ,	1876-1879.
HERMAN C. G. BRANDT, . . . <i>German</i> ,	1876-1882.
WILLIAM K. BROOKS, . . . <i>Biology</i> ,	1876-
HARMON N. MORSE, . . . <i>Chemistry</i> ,	1876-
ROBERT RIDGWAY, . . . <i>Natural History</i> ,	1876-1877.
WILLIAM E. STORY, . . . <i>Mathematics</i> ,	1876-
ARTHUR W. TYLER, . . . <i>Librarian</i> ,	1876-1878.
CHARLES S. HASTINGS, . . . <i>Physics</i> ,	1876-
CHARLES R. LANMAN, . . . <i>Sanskrit</i> ,	1877-1880.
HERBERT B. ADAMS, . . . <i>History</i> ,	1878-
ALBERT S. COOK, . . . <i>English</i> ,	1879-1881.
MINTON WARREN, . . . <i>Latin</i> ,	1879-
WILLIAM HAND BROWNE, <i>Librarian</i> ,	1879-

* The names in each group are arranged in the order of appointment.

		Years of Service.
HENRY SEWALL, . . .	<i>Biology, . . .</i>	. 1880-1882.
THOMAS CRAIG, . . .	<i>Mathematics, . . .</i>	. 1880-
MAURICE BLOOMFIELD, . . .	<i>Sanskrit, . . .</i>	. 1881-
WILLIAM T. SEDGWICK, . . .	<i>Biology, . . .</i>	. 1881-
HENRY WOOD, . . .	<i>English, . . .</i>	. 1881-
FABIAN FRANKLIN, . . .	<i>Mathematics, . . .</i>	. 1882-
RICHARD T. ELY, . . .	<i>Political Economy, . . .</i>	. 1882-

LECTURERS.

SIMON NEWCOMB, . . .	<i>Astronomy, . . .</i>	. 1876.
LÉONCE RABILLON, . . .	<i>French, . . .</i>	. 1876-
JOHN S. BILLINGS, . . .	<i>Medical History, etc., . . .</i>	. 1877.
FRANCIS J. CHILD, . . .	<i>Early English, etc., . . .</i>	. 1877-1878.
THOMAS M. COOLEY, . . .	<i>Law, . . .</i>	. 1877-1879.
JULIUS E. HILGARD, . . .	<i>Geodetic Surveys, . . .</i>	. 1877.
JAMES RUSSELL LOWELL, . . .	<i>Romance Literature, . . .</i>	. 1877.
JOHN W. MALLET, . . .	<i>Technological Chemistry, . . .</i>	. 1877-1878.
FRANCIS A. WALKER, . . .	<i>Political Economy, . . .</i>	. 1877-1878.
WILLIAM D. WHITNEY, . . .	<i>Comparative Philology, . . .</i>	. 1877.
WILLIAM F. ALLEN, . . .	<i>History, . . .</i>	. 1878.
WILLIAM JAMES, . . .	<i>Psychology, . . .</i>	. 1878.
GEORGE S. MORRIS, . . .	<i>Philosophy, . . .</i>	. 1878-
J. LEWIS DIMAN, . . .	<i>History, . . .</i>	. 1879.
H. VON HOLST, . . .	<i>History, . . .</i>	. 1879.
WILLIAM G. FARLOW, . . .	<i>Botany, . . .</i>	. 1879.
J. WILLARD GIBBS, . . .	<i>Theoretical Mechanics, . . .</i>	. 1879.
SIDNEY LANIER, . . .	<i>English Literature, . . .</i>	. 1879-1881.
CHARLES S. PEIRCE, . . .	<i>Logic, . . .</i>	. 1879-
JOHN TROWBRIDGE, . . .	<i>Physics, . . .</i>	. 1880.
A. GRAHAM BELL, . . .	<i>Phonology, . . .</i>	. 1881.
S. P. LANGLEY, . . .	<i>Physics, . . .</i>	. 1881.
JOHN MCCRADY, . . .	<i>Biology, . . .</i>	. 1881.
JAMES BRYCE, . . .	<i>Political Science, . . .</i>	. 1881
EDWARD A. FREEMAN, . . .	<i>History, . . .</i>	. 1881.
JOHN J. KNOX, . . .	<i>Banking, . . .</i>	. 1881.
ARTHUR CAYLEY, . . .	<i>Mathematics, . . .</i>	. 1882.
WILLIAM W. GOODWIN, . . .	<i>Plato, . . .</i>	. 1882.

		Years of Service.
G. STANLEY HALL, .	<i>Psychology, . . .</i>	. 1882-
RICHARD M. VENABLE, .	<i>Constitutional Law, .</i>	. 1882.
JAMES A. HARRISON, .	<i>Anglo-Saxon, . . .</i>	. 1882-
J. RENDEL HARRIS, .	<i>New Testament Greek, .</i>	. 1882-

INSTRUCTORS AND ASSISTANTS.

HENRY SEWALL, .	<i>Biology, . . .</i>	. 1876-1878.
SAMUEL F. CLARKE, .	<i>Biology, . . .</i>	. 1879-1881.
FABIAN FRANKLIN, .	<i>Mathematics, . . .</i>	. 1879-1882.
LYMAN B. HALL, .	<i>Chemistry, . . .</i>	. 1879-1880.
CHRISTIAN SIHLER, .	<i>Biology, . . .</i>	. 1879-1880.
HENRY C. ADAMS, .	<i>Political Economy, .</i>	. 1879-1881.
THOMAS CRAIG, .	<i>Mathematics, . . .</i>	. 1879-1880.
CHAS. L. WOODWORTH, .	<i>Elocution, . . .</i>	. 1879-
WILLIAM T. SEDGWICK, .	<i>Biology, . . .</i>	. 1880-1881.
EDWIN H. HALL, .	<i>Physics, . . .</i>	. 1880-1881.
GEORGE H. STOCKBRIDGE, .	<i>Latin and German, .</i>	. 1880-1881.
PHILIPPE B. MARCOU, .	<i>French, . . .</i>	. 1880-
HUGH NEWELL, .	<i>Drawing, . . .</i>	. 1880-
R. DORSEY COALE, .	<i>Chemistry, . . .</i>	. 1881-
RICHARD T. ELY, .	<i>Political Economy, .</i>	. 1881-1882.
LAWRENCE B. FLETCHER, .	<i>Physics, . . .</i>	. 1881.
GEORGE F. NICOLASSEN, .	<i>Greek and Latin, .</i>	. 1881-1882.
BENJAMIN E. SMITH, .	<i>Philosophy, . . .</i>	. 1881-1882.
EDMUND B. WILSON, .	<i>Biology, . . .</i>	. 1881-1882.
JAMES W. BRIGHT, .	<i>German, . . .</i>	. 1882-
J. FRANKLIN JAMESON, .	<i>History, . . .</i>	. 1882-
EDWARD H. SPIEKER, .	<i>Greek and Latin, .</i>	. 1882-
HARRY F. REID, .	<i>Physics, . . .</i>	. 1882-

B.

Roll of Fellows.

The following list gives the names of all persons who have been selected by the authorities and appointed to fellowships. Though, in a few cases, by reason of promotion or other causes, the persons designated have not entered upon the fellowships, their names are given to exhibit fully the working of this system of appointment.

The present position or residence of the former holders of fellowships is, in most cases, given after the name.

	Years of Service.
HENRY C. ADAMS, PH. D., <i>Political Science</i> , Lecturer on Political Economy, University of Michigan.	1876-1879.
HERBERT B. ADAMS, PH. D., <i>History</i> , Associate in History, Johns Hopkins University.	1876-1878.
WILLIAM K. BROOKS, PH. D., <i>Biology</i> , Associate in Biology, and Director of Chesapeake Zoölogical Laboratory, Johns Hopkins University. (<i>Appointed Associate, 1876, before entering on the Fellowship</i>).	
THOMAS CRAIG, PH. D., <i>Mathematics</i> , Associate in Mathematics, Johns Hopkins University.	1876-1879.
JOSHUA W. GORE, C. E., <i>Mathematics</i> , Professor of Natural Science, University of North Carolina.	1876-1878.
GEORGE B. HALSTED, PH. D., <i>Mathematics</i> , Instructor in Post-Graduate Mathematics, Princeton College.	1876-1878.
EDWARD HART, PH. D., <i>Chemistry</i> , Assistant Professor of Chemistry, Lafayette College.	1876-1878.
DANIEL W. HERING, C. E., <i>Engineering</i> , Professor of Mathematics, Western Maryland College.	1876-1878.
MALVERN W. ILES, PH. D., <i>Chemistry</i> , Chemist, Leadville, Colorado.	1876-1878.
WILLIAM W. JACQUES, PH. D., <i>Physics</i> , Electrician of the American Bell Telephone Co., Boston, Mass.	1876-1879.
CHARLES R. LANMAN, PH. D., <i>Sanskrit</i> , Professor of Sanskrit, Harvard University.	1876-1877.
D. MCGREGOR MEANS, A. B., <i>Political Science</i> , Late Professor of Political and Mental Science, Middlebury College; Attorney at Law, New York City.	1876-1877.
HARMON N. MORSE, PH. D., <i>Chemistry</i> , Associate in Chemistry, Johns Hopkins University. (<i>Appointed Associate, 1876, before entering upon the Fellowship</i>).	
WALTER H. PAGE, <i>Greek</i> , Late Professor in the Louisville (Ky.) High School.	1876-1878.
P. PORTER POINIER, M. E., <i>Physics</i> , (<i>Died without entering upon the Fellowship, June, 1876, aged 23 years</i>).	
E. DARWIN PRESTON, C. E., <i>Engineering</i> , U. S. Coast and Geodetic Survey, Washington, D. C.	1876-1878.
HENRY J. RICE, SC. D., <i>Biology</i> , Professor of Natural Sciences, Michigan Military Academy, Orchard Lake, Mich.	1876-1878.
JOSIAH ROYCE, PH. D., <i>Philosophy</i> , Instructor in Philosophy, Harvard University.	1876-1878.

- ERNEST G. SIHLER, PH. D., . . . *Greek*, . . . 1876-1879.
Classical Instructor, New York City.
- FREDERICK B. VAN VORST, A. B., . . . *Ethics & Metaphysics*, 1876-1877.
Attorney at Law, New York City.
- JOHN H. WHEELER, PH. D., . . . *Philology*, . . . 1876-1877.
Professor of Greek, University of Virginia.
- SAMUEL F. CLARKE, PH. D., . . . *Biology*, . . . 1876-1879.
Professor of Natural History, Williams College.
- LYMAN B. HALL, PH. D., . . . *Chemistry*, . . . 1877-1879.
Professor of Chemistry and Physics, Haverford College, Pa.
- A. DUNCAN SAVAGE, B. LITT., . . . *Greek*, . . . 1876-1879.
Metropolitan Museum of Art, New York City, 1879-81.
- FABIAN FRANKLIN, PH. D., . . . *Mathematics*, . . . 1877-1879.
Associate in Mathematics, Johns Hopkins University.
- CHRISTIAN SIHLER, PH. D., . . . *Biology*, . . . 1877-1879.
Physician, Cleveland, Ohio.
- FRANCIS G. ALLINSON, PH. D., . . . *Greek and Sanskrit*, 1877-1880.
Assistant Professor of Greek and Latin, Haverford College, 1880-82; Classical Instructor, Baltimore.
- MAURICE BLOOMFIELD, PH. D., . . . *Sanskrit and Greek*, 1878-1879.
Associate in Sanskrit, Johns Hopkins University.
- CONSTANTINE FAHLBERG, PH. D., . . . *Chemistry*, . . . 1878-1880.
Chemist, Gray's Ferry Chemical Works, Philadelphia.
- EDWIN H. HALL, PH. D., . . . *Physics*, . . . 1878-1880.
Instructor in Physics, Harvard University.
- EDWARD COLES HARDING, A. M., . . . *Greek*, . . . 1878-1879.
Professor of Greek, University of Louisiana, 1879-80.
- ISAAC OTT, M. D., . . . *Biology*, . . . 1878-1879.
Physician, Easton, Pa.
- HENRY SEWALL, PH. D., . . . *Biology*, . . . 1878-1879.
Professor of Physiology, University of Michigan.
- WASHINGTON I. STRINGHAM, PH. D., *Mathematics*, . . . 1878-1880.
Professor of Mathematics, University of California.
- ABRAM V. E. YOUNG, PH. B., . . . *Chemistry*, . . . 1878-1880.
Student of Chemistry, Paris, France.
- CHARLES R. HEMPHILL, A. M., . . . *Greek*, . . . 1878-1879.
Professor, Theological Seminary, Columbia, S. C.
- ALLAN MARQUAND, PH. D., . . . *Logic and Ethics*, . . . 1877-1880.
Lecturer on Modern Logic and Tutor in Latin, Princeton College.
- CHARLES A. VAN VELZER, S. B., . . . *Mathematics*, . . . 1878-1881.
Instructor in Mathematics, University of Wisconsin.
- BROWN AYRES, S. B., . . . *Physics*, . . . 1879-1880.
Professor of Physics, University of Louisiana, New Orleans.
- LOUIS BEVIER, PH. D., . . . *Greek*, . . . 1879-1881.
Student of Philology, University of Bonn.
- EDWARD M. HARTWELL, PH. D., . . . *Biology*, . . . 1879-1881.
Physician, Cincinnati, Ohio.
- JOHN R. MCD. IRBY, PH. D., . . . *Mineralogy*, . . . 1879-1880.
(Died, March 26, 1880, aged 25 years).
- MITSURU KUHARA, PH. D., . . . *Chemistry*, . . . 1879-1881.
Curator of the Scientific Museums, University of Tokio, Japan.

- OSCAR H. MITCHELL, PH. D., . . . *Mathematics*, . . . 1879-1882.
Professor of Mathematics, Marietta College.
- EDWARD L. NICHOLS, PH. D., . . . *Physics*, . . . 1879-1880.
Professor of Physics and Chemistry, Central University, Richmond, Ky.
- WALDO S. PRATT, A. M., . . . *Aesthetics, etc.*, . . . 1879-1880.
Instructor in Ecclesiastical Music, Theological Seminary, Hartford, Conn.
- WILLIAM T. SEDGWICK, PH. D., . . . *Biology*, . . . 1879-1880.
Associate in Biology, Johns Hopkins University.
- HERMANN VOORHEES, C. E., . . . *Chemistry*, . . .
(*Died without entering on the Fellowship, October 14, 1879, aged 27 years*).
- CHARLES O. WHITMAN, PH. D., . . . *Biology*, . . .
Professor of Zoölogy, University of Tokio, Japan, 1879-81; Marine Station, Naples, 1881-82. (*Resigned, 1879, before entering on the Fellowship*).
- EDMUND B. WILSON, PH. D., . . . *Biology*, . . . 1879-1881.
Assistant in the Biological Laboratory, Johns Hopkins University, 1881-82.
- GEORGE F. NICOLASSEN, PH. D., . . . *Greek*, . . . 1879-1881.
Professor of Greek and Latin, Southwestern Presbyterian University, Tenn.
- WILLIAM BURNEY, PH. D., . . . *Chemistry*, . . . 1879-1880.
Professor of Chemistry, South Carolina College.
- ROBERT W. PRENTISS, S. B., . . . *Mathematics*, . . . 1879-1881.
Office of U. S. Nautical Almanac, Washington, D. C.
- JAMES W. BRIGHT, PH. D., . . . *Teutonic Languages*, 1880-1882.
Assistant in German, Johns Hopkins University.
- BENJAMIN O. BURT, A. M., . . . *Philosophy*, . . . 1880-1881.
Assistant Professor of English and Rhetoric, University of Michigan.
- SPENCER H. FREEMAN, A. M., . . . *Physics*, . . . 1880-1882.
Professor of Physics, Adelbert College, Cleveland, Ohio.
- KAKICHI MITSUKURI, PH. B., . . . *Biology*, . . . 1880-1881.
Lecturer on Zoölogy, University of Tokio, Japan.
- BERNARD F. O'CONNOR, B. ES LETT., *Romance Languages*, 1880-1882.
Fellow by Courtesy, Johns Hopkins University.
- CHASE PALMER, PH. D., . . . *Chemistry*, . . . 1880-1882.
Assistant in Chemistry, Massachusetts Institute of Technology, Boston.
- HERBERT M. PERRY, A. B., . . . *Mathematics*, . . . 1880-1882.
New Ipswich, N. H.
- WILLIAM L. ROWLAND, S. B., . . . *Chemistry*, . . .
(*Did not enter upon the Fellowship, 1880*).
- EDWARD H. SPIEKER, PH. D., . . . *Greek*, . . . 1880-1882.
Assistant in Greek and Latin, Johns Hopkins University.
- MORRISON I. SWIFT, A. B., . . . *Philosophy*, . . . 1880-1882.
Ashtabula, Ohio.
- ARTHUR W. WHEELER, A. B., . . . *Physics*, . . . 1880-1881.
(*Died, January 6, 1881, aged 21 years*).
- R. DORSEY COALE, PH. D., . . . *Chemistry*, . . . 1880-1881.
Assistant in Chemical Laboratory, Johns Hopkins University.
- A. F. WILHELM SCHIMPER, PH. D., *Biology*, . . . 1880-1881.
University of Bonn, Germany.
- LAWRENCE B. FLETCHER, PH. D., . . . *Physics*, . . . 1880-1881.
Instructor in Physics, Wesleyan University, Middletown, Conn.
- WILLIAM J. ALEXANDER, A. B., . . . *Greek*, . . . 1881-

EDWARD S. BURGESS, A. B.,	<i>Greek,</i>	1881-1882.
Instructor, Washington (D. C.) High School.		
WILLIAM J. COMSTOCK, PH. B.,	<i>Chemistry,</i>	1881-1882.
Student of Chemistry, University of Munich.		
WILLIAM C. DAY, A. B.,	<i>Chemistry,</i>	1881-
HENRY H. DONALDSON, A. B.,	<i>Biology,</i>	1881-
WILLIAM P. DURFEE, A. B.,	<i>Mathematics,</i>	1881-
GEORGE S. ELY, A. B.,	<i>Mathematics,</i>	1881-
J. FRANKLIN JAMESON, PH. D.,	<i>History,</i>	1881-1882.
Assistant in History, Johns Hopkins University.		
C. HERSCHEL KOYL, A. B.,	<i>Physics,</i>	1881-
HENRY L. OSBORN, A. B.,	<i>Biology,</i>	1881-1882.
HENRY N. STOKES, S. B.,	<i>Biology,</i>	1881-
BENJAMIN W. WELLS, PH. D.,	<i>English,</i>	1881.
Instructor in English, Friends' School, Providence, R. I. (<i>Resigned, Oct., 1881.</i>)		
BENJAMIN I. GILMAN, A. M.,	<i>Logic,</i>	1881-1882.
Fellow by Courtesy, Johns Hopkins University.		
CHARLES J. BELL, A. B.,	<i>Chemistry,</i>	
Professor of Chemistry, Pennsylvania State College, Center Co., Pa. (<i>Did not enter upon the Fellowship, 1882.</i>)		
JAMES M. CATTELL, A. B.,	<i>Philosophy,</i>	1882-
ELLERY W. DAVIS, S. B.,	<i>Mathematics,</i>	1882-
DAVID T. DAY, A. B.,	<i>Chemistry,</i>	1882-
ALFRED EMERSON, PH. D.,	<i>Greek,</i>	1882-
WILLIAM S. FLEMING, A. B.,	<i>Greek,</i>	1882-
ARTHUR L. FROTHINGHAM,	<i>Shemitic Languages,</i>	1882-
HENRY R. GOODNOW, A. B.,	<i>Physics,</i>	1882-
ELGIN R. L. GOULD, A. B.,	<i>History,</i>	1882-
ARTHUR S. HATHAWAY, S. B.,	<i>Mathematics,</i>	1882-
WILLIAM H. HOWELL, A. B.,	<i>Biology,</i>	1882-
ARTHUR L. KIMBALL, A. B.,	<i>Physics,</i>	1882-
HARRY F. REID, A. B.,	<i>Physics,</i>	1882.
Assistant in Physics, Johns Hopkins University.		
EDWARD H. KEISER, S. B.,	<i>Chemistry,</i>	1882-

C. Graduates.

DEGREES CONFERRED HONORIS CAUSA.

1880.

HENRY A. ROWLAND, Ph. D.
Professor of Physics, Johns Hopkins University.

1881.

RUTHERFORD B. HAYES, LL. D.
President of the United States.

DEGREES CONFERRED ON EXAMINATION.

1878.

DOCTORS OF PHILOSOPHY.

- HENRY CARTER ADAMS. (F).**
A. B., Iowa, 1874.—Lecturer on Political Economy, University of Michigan.
- THOMAS CRAIG. (F).**
C. E., Lafayette, 1875.—Associate in Mathematics, Johns Hopkins University.
- JOSIAH ROYCE. (F).**
A. B., Univ. of California, 1875.—Instructor in Philosophy, Harvard University.
- ERNEST GOTTLIEB SIHLER. (F).**
Concordia, 1869.—Classical Instructor, New York City. (4)

1879.

DOCTORS OF PHILOSOPHY.

- MAURICE BLOOMFIELD. (F).**
A. M., Furman, 1877.—Associate in Sanskrit, Johns Hopkins University.
- SAMUEL FESSENDEN CLARKE. (F).**
Ph. B., Yale, 1878.—Professor of Natural History, Williams College.
- GEORGE BRUCE HALSTED. (F).**
A. B., Princeton, 1875.—Instructor in Post-Graduate Mathematics, Princeton College.
- EDWARD HART. (F).**
S. B., Lafayette, 1874.—Assistant Professor of Chemistry, Lafayette College.
- WILLIAM WHITE JACQUES. (F).**
S. B., Mass. Inst. of Technology, 1876.—Electrician, Boston, Mass.
- HENRY SEWALL. (F).**
S. B., Wesleyan, 1876.—Professor of Physiology, University of Michigan. (6)

BACHELORS OF ARTS.

- GEORGE WASHINGTON MCCREARY.**
Engaged in mercantile pursuits, Baltimore.
- CHASE PALMER. (F).**
Assistant in Chemistry, Massachusetts Institute of Technology.
- EDWARD HENRY SPIEKER. (F).**
Assistant in Greek and Latin, Johns Hopkins University. (3)

F. Holders of Fellowships.

1880.

DOCTORS OF PHILOSOPHY.

- FRANCIS GREENLEAF ALLINSON.** (F).
A. B., Haverford, 1876; A. B., Harvard, 1877.—Late Assistant Professor of Greek and Latin, Haverford College; Classical Instructor, Baltimore.
- FABIAN FRANKLIN.** (F).
Ph. B., Columbian, 1869.—Associate in Mathematics, Johns Hopkins University.
- EDWIN HERBERT HALL.** (F).
A. B., Bowdoin, 1875.—Instructor in Physics, Harvard University.
- ALLAN MARQUAND.** (F).
A. B., Princeton, 1874.—Lecturer on Logic, etc., Princeton College.
- WASHINGTON IRVING STRINGHAM.** (F).
A. B., Harvard, 1877.—Professor of Mathematics, University of California. (5)

BACHELORS OF ARTS.

- THOMAS MILTON BEADENKOPF.**
Assistant, Library of Peabody Institute, Baltimore.
- ALLEN KERE BOND.**
M. D., University of Maryland, 1882.—Physician, Baltimore.
- WILLIAM CATHOART DAY.** (F).
Fellow, Johns Hopkins University.
- HENRY LAURENCE GANTT.**
Instructor, McDonogh School.
- EDGAR GOODMAN.**
LL. B., University of Maryland, 1881.—Attorney at Law, Baltimore.
- CARL ECKHARDT GRAMMER.**
Student of Theology, Virginia Theological Seminary.
- ALEXANDER FRIDGE JAMISON.**
Instructor, Trenton, N. J.
- EDMUND ALLEN JARVIS.**
Died, October 15, 1880, aged 22 years.
- STEWART BRIAN LINTHICUM.**
LL. B., University of Maryland, 1882.—Attorney at Law, Baltimore.
- JOHN HANSON LOWE.**
LL. B., University of Maryland, 1882.—Attorney at Law, Baltimore.
- LEIGH CLINTON MORGAN.**
Clergyman, Bunker Hill, W. Va.
- NELSON PALMER.**
Baltimore.
- THOMAS PETTIGREW.**
Creswell, N. C.
- HARRY FIELDING REID.** (F).
Assistant in Physics, Johns Hopkins University.
- WILTZ RAYMOND STRICKLEN.**
Clergyman, Arlington, Md.
- LEWIS WEBB WILHELM.**
Graduate Scholar, Johns Hopkins University. (16)

1881.

DOCTORS OF PHILOSOPHY.

- LOUIS BEVIER.** (F).
A. B., Rutgers, 1878.—Student of Philology, University of Bonn.

- ROBERT DORSEY COALE.** (F).
Assistant in Chemistry, Johns Hopkins University.
- EDWARD ALLEN FAY.**
A. B., University of Michigan, 1862.—Professor of History and Languages, National Deaf-Mute College.
- LAWRENCE BUNTING FLETCHER.** (F).
A. B., Columbia, 1877.—Instructor in Physics, Wesleyan University.
- SAMUEL GARNER.**
A. B., St. Johns, 1871.—Professor of Modern Languages, University of Indiana.
- EDWARD MUSSEY HARTWELL.** (F).
A. B., Amherst, 1873; M. D., Miami Medical College, 1882.—Physician, Cincinnati, O.
- WILLIAM THOMPSON SEDGWICK.** (F).
Ph. B., Yale, 1877.—Associate in Biology, Johns Hopkins University.
- CHRISTIAN SIHLER.** (F).
Concordia, 1886.—Physician, Cleveland, O.
- EDMUND BEECHER WILSON.** (F).
Ph. B., Yale, 1878.—Late Assistant in Biology, Johns Hopkins University. (9)

BACHELORS OF ARTS.

- WILLIAM WILSON BADEN.**
Student of Law, University of Maryland.
- HENRY JOHNS BOWDOIN.**
Student of Law, University of Maryland.
- JOHN WILSON BROWN.**
Baltimore.
- DAVID TALBOTT DAY.** (F).
Fellow, Johns Hopkins University.
- WILLIAM HENRY HOWELL.** (F).
Fellow, Johns Hopkins University.
- JOHN JOHNSON.**
Instructor, McDonogh School.
- JAMES EDWARD KEELER.**
Assistant, Allegheny (Pa.) Astronomical Observatory.
- EDWIN GEORGE RICHARDSON.**
Clergyman, Newark, N. J.
- ADONIRAM JUDSON ROBINSON.**
Graduate Student, Johns Hopkins University.
- HENRY ROLANDO.**
Student of Medicine, University of Maryland.
- LEE SALE.**
Student of Law, Louisville, Ky.
- MACTIER WARFIELD.**
Student of Medicine, University of Maryland. (12)

1882.

DOCTORS OF PHILOSOPHY.

- JAMES WILSON BRIGHT.** (F).
A. B., Lafayette, 1877.—Assistant in German, Johns Hopkins University.
- JOHN FRANKLIN JAMESON.** (F).
A. B., Amherst, 1879.—Assistant in History, Johns Hopkins University.
- MITSURU KUHARA.** (F).
B. B., University of Tokio, 1877.—Curator of the Museums, University of Tokio.

ROBERT W. MAHON.

C. E., Lehigh, 1876.—Tutor in Chemistry, Lafayette College.

OSCAR HOWARD MITCHELL. (F).

A. B., Marietta, 1875.—Professor of Mathematics, Marietta College.

GEORGE FREDERICK NICOLASSEN. (F).

A. B., University of Virginia, 1879.—Professor of Ancient Languages, Southwestern Presbyterian University.

WILLIAM ALBERT NOYES.

A. B., Iowa, 1879.—Assistant Professor of Chemistry, University of Minnesota.

CHASE PALMER. (F).

A. B., Johns Hopkins, 1879.—Assistant in Chemistry, Mass. Institute of Technology.

EDWARD HENRY SPIEKER. (F).

A. B., Johns Hopkins, 1879.—Assistant in Greek and Latin, Johns Hopkins University. (9)

BACHELORS OF ARTS.

WILLIAM HUGHLETT ADKINS.

Student of Law, University of Maryland.

THOMAS ALEXIS BERRY.

Pursuing his studies in Germany.

GUSTAV BISSING.

Graduate Scholar, Johns Hopkins University.

WALTER BERNARD CLARKSON.

Principal, Duval High School, Jacksonville, Fla.

HERMANN LOUIS EBELING.

Instructor, Bloomfield, N. J.

LOUIS GARTHE.

Graduate Student, Johns Hopkins University.

EDWARD INGLE.

Graduate Student, Johns Hopkins University.

RICHARD FULLER KIMBALL.

Student of Law, University of Maryland.

GUSTAV ADOLPH LIEBIG, JR.

Graduate Student, Johns Hopkins University.

CHARLES WILLIAM EMIL MILLER.

Graduate Scholar, Johns Hopkins University.

JAMES PAGE.

Graduate Student, Johns Hopkins University.

ALBERT GALLATIN PALMER.

Graduate Student, Johns Hopkins University.

ROBERT MILLER REESE.

Baltimore.

LEWIS TEBBETTS STEVENS.

Graduate Scholar, Johns Hopkins University.

HERBERT THORNDYKE TIFFANY.

Graduate Student, Johns Hopkins University.

(15)

TOTAL (1878-82.)

DOCTORS OF PHILOSOPHY,	33
BACHELORS OF ARTS,	46

D.

System of Fellowships.

Twenty fellowships are annually open to competition in this university, each yielding five hundred dollars and exempting the holder from all charges for tuition.

OBJECT OF THE FOUNDATION.

The system of fellowships was instituted for the purpose of affording to young men of talent from any place an opportunity of continuing their studies in the Johns Hopkins University, while looking forward to positions as professors, teachers, and investigators, or to other literary and scientific vocations. The appointments have not been made as rewards for good work already done, but as aids and incentives to good work in the future; in other words, the fellowships are not so much honors and prizes bestowed for past achievements, as helps to further progress, and stepping stones to honorable intellectual careers. They have not been offered to those who are definitely looking forward to the practice of either of the three learned professions (though such persons have not been formally excluded from the competition), but have been bestowed almost exclusively on young men desirous of becoming teachers of science and literature, or proposing to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician, and the minister.

Every candidate is expected to submit his college diploma or other certificate of proficiency from the institution where he has been taught, with recommendations from those who are qualified to speak of his character and attainments. But this is only introductory. He must also submit, orally or in writing, such evidence of his past success in study, and of his plans for the future, together with such examples of his literary or scientific work, as will enable the professors to judge of his fitness for the post. The examination is indeed in a certain sense competitive; but not with uniform tests, nor by formal questions submitted to the candidates. First, the head of a given department considers, with such counsel as he may command, the applicant's record. The professors then collectively deliberate on the nominations made by individual members of their body. The list upon which they agree, with the reasons for it, is finally submitted by the president of the university to the executive committee, and by them to the trustees for final registration and appointment. By all these precautions, the highest results which were anticipated have been secured. A company of most promising students has been brought together, and their ability as teachers and scholars has been recognized by the calls they have received to permanent and desirable posts in different parts of the country.

The number of applications for fellowships has hitherto been very large, and it may have happened that some candidates have failed of appointment who were really superior to those selected. But, if so, this has resulted from the fact, that a considerable number of applicants have each year forwarded to the university merely testimonials from their instructors without any such examples of their own work as have been mentioned above; and in consequence, the professors, from want of adequate knowledge, have been compelled to pass over candidates who may have been in the highest degree meritorious.

It is obvious from the nature of the case that graduate students residing in Baltimore must have better opportunities than others of making known their powers to the appointing board; but the absence of candidates from Baltimore has been no bar to their appointment, in cases where adequate evidence of their claims has been presented.

REGULATIONS.

1. The application must be made in writing.
2. The candidate must give evidence of a liberal education, such as the diploma of a college of good repute; of decided proclivity towards a special line of study, such as an example of some scientific or literary work already performed; and of upright character, such as a testimonial from some instructor.
3. The value of each fellowship will be five hundred dollars. In case of resignation, promotion, or other withdrawal from the fellowship, payments will be made for the time during which the office shall have been actually held.
4. Every holder of a fellowship will be expected to render some services to the institution as an examiner, to give all his influence for the promotion of scholarship and good order, and in general to co-operate in upholding the efficiency of the university, as circumstances may suggest. He must reside in Baltimore, during the academic year.
5. He will be expected to devote his time to the prosecution of special study (not professional), with the approval of the president, and before the close of the year, to give evidence of progress by the preparation of a thesis, the completion of a research, the delivery of a lecture, or by some other method.
6. He may give instruction, with the approval of the president, by lectures or otherwise, to persons connected with the university, but he may not engage in teaching elsewhere.
7. He may be re-appointed at the end of the year.
8. The appointments are usually made as follows:
In mathematics, three; chemistry, three; physics, three; biology, three; Greek, three; other subjects, five.
9. *Applications for the next year should reach the university before May 11, 1883.*

II.

The Johns Hopkins University as a Place
for College Students.

[Reprint of a University Circular, issued May 12, 1882, referred to at page 11].

The Johns Hopkins University invites the attention of the residents of Maryland and of the adjacent region, and especially of the citizens of Baltimore, to the opportunities here afforded for acquiring a college training.

The reputation which the university has gained at a distance, as well as at home, by the work which its teachers have done in the advancement of science, and by the publications which it has encouraged, diverts the attention of casual observers from the advantages offered in its collegiate instruction. Even the public lectures given by resident and non-resident professors, have been so generously reported in the newspapers, that they sometimes appear as the principal work, and not in their true aspect as courses auxiliary and subordinate to the ordinary instruction.

The trustees have always been mindful that they were to maintain a university for the advanced education of youth fitted for such higher training, and they have been gratified to observe how soon the advantages here offered were appreciated in distant regions by young men who have come to Baltimore in considerable numbers for the prosecution of their studies.

But from the beginning, the authorities have held to the belief that university instruction depends upon collegiate; and that a good university must either include a college, or must be so placed that it can influence and attract the students of colleges independently maintained. Some generous person, desiring to add still greater attractions to the city for which Peabody, Hopkins, and Pratt have done so much, might well endow a college for young men, another might endow a college for young women,—and both such foundations, whether affiliated with the Johns Hopkins University, or independent of it, might derive extraordinary advantages from its neighborhood, and from the professors, the collections, the laboratories, and the other agencies which the university will provide.

At present, however, this university, in addition to what it offers to graduates and others who are prepared for advanced study, maintains instruction for undergraduate students, candidates for the customary degree of bachelor of arts. While admitting that there are advantages offered by older institutions which cannot at once be provided in a new place, we may claim that there are other advantages which this institution possesses in its freedom from restrictions, in its ample funds, and in its readiness to adopt those regulations which the experience of older institutions has proved to be desirable, though they are not always practicable where routine and usage have long prevailed.

Let us consider some of these points. Of late years, there has been a great deal of discussion respecting the proper plan of study to be recommended to young men who seek a liberal education. Much can be said in favor of prescribing one course to be followed by all who look towards the baccalaureate degree. Usage is in its favor; so is economy; so is the testimony of many wise men who have had this training and who know its value. On the other hand, the number of modern sciences which call for recognition is so large, and the attainments exacted by the various callings of modern society are so numerous and diverse, that it is really a difficult matter to decide between conflicting claims. In some places, freedom of choice on the part of every student is permitted; elsewhere, some of the studies are required of all students and others are optional,—the extent to which option is allowed varying very much; in other places scientific colleges are maintained by the side of classical colleges; and again there are institutions which continue to allow no choice whatever and provide but one course for all.

The plan adopted in Baltimore is this. No distinction is made between the scientific departments and what has elsewhere been called "the college proper"; all the courses lead to one and the same degree (bachelor of arts) and are intended to be equally difficult, and to require an equal amount of time. The standard of matriculation, alike for all students, is somewhat higher than is common in American colleges, in order that as much as possible of preliminary discipline may be acquired in the preparatory schools. But this training can be readily obtained in the best schools of Baltimore, or with private resident teachers. All who

desire to take an academic degree are expected "to matriculate." After doing so, they have some degree of choice but not absolute freedom. In accordance with parental advice and with the counsel of a member of the faculty who acts as an Adviser, every student must decide upon one of several combinations of study which are offered to him. The combinations may be named as follows: I. Classical; II. Mathematical; III. Literary; IV. Scientific; V. Preliminary to Medicine; VI. Preliminary to Theology; VII. Preliminary to Law.

The dominant character of each course may be inferred from its designation, but a more definite notion can be acquired from the official register, which is annually published. Without repeating the details, it may be said that the scholar who successfully goes through any one of these combinations of study should during its progress have shown that he has at least the usual collegiate proficiency in algebra, geometry, trigonometry, and analytical geometry; in English, French, German, Latin, and Greek (unless excused in the last named subject to gain more time for scientific studies); physics or chemistry or both; and in some branches of history and philosophy.

The time required to complete any of these courses may be three or four years; or it may be less if the student comes with attainments beyond what are demanded for matriculation, or if he is favored by the possession of unusual ability. He is not kept back by the ordinary class-system. He proceeds at a slower or a more rapid rate according to circumstances.

It is obvious that to give efficiency to these arrangements a large staff of teachers is requisite. There are at present not less than twenty-seven who take some part in the instruction of undergraduate students, and as the teaching staff is large in proportion to the number to be taught, the scholars have a corresponding advantage. They are individually well known to their instructors and are brought into familiar relations with them, so that their various intellectual needs secure personal attention.

The presence of a company of older and more advanced students in the university exerts a strong influence upon undergraduates. The whole establishment becomes a laboratory where every body is busy, and where enthusiasm in study is the predominant characteristic. Minute regulations are not often called for,

because the interest awakened in pursuits which the scholar himself has chosen, secures application and industry on the part of nearly all; and the few who are indifferent to the advantages afforded them soon drop out of the ranks.

Personal acquaintance with one and another advanced student leaving our halls to assume a position of usefulness and honor, acts as a powerful stimulant upon those who are still in an earlier stage of discipline. They see what results follow devotion to study. Moreover the graduate students come from widely different regions, tending to make this university a national institution; so that, while its aggregate attendance is not as yet very large, it includes men of diverse antecedents, training, and expectations, and leads to that knowledge of human nature and of civil society which comes from an acquaintance with men of widely different circumstances. The poor and the rich, the city boy and the country boy, the foreigner and the native, the quick and the slow, the lover of books and the lover of experiment, are brought together in the same class rooms, laboratories, and societies, in walks, in sports, in religious and charitable duties, and in all the associations of academic life.

Professor Dunbar, Dean of the Harvard Faculty, recently made the following remark in respect to the influence of university students upon those of a college:

... "All students in College, it is believed, feel the effect of a more stimulating intellectual atmosphere, created by the presence and example of persons engaged in the highest pursuits. Both as regards the intellectual activity of students and the quality of the instructing body, the vigorous life of the *College* hereafter is to be promoted most effectively by the building up of a broad and solid structure of *University* work."

A still stronger, though perhaps a less obvious influence is exerted upon collegiate students by the certainty that their teachers are known in the world at large as contributors to the advancement of knowledge. The presence of a renowned professor is felt beyond the limited circle of those who follow his appointed lectures. All members of the university are influenced by his methods of investigation and by his publications, and they almost feel entitled to share in the honors which he gains.

Among the minor usages which has found favor in this university is the employment of paid examiners, (who have had no part in

the instruction of the classes), to set papers and mark the answers in special branches of study. The teacher also examines his class,—but when a second paper is set by the university examiner, the scholar is aware that his attainments are to be tested by two standards,—that of his instructor, with whose methods he is of course familiar, and that of another judge whose lessons he has never followed. The trial is severe, but its disciplinary influence is good.

Again, the private reading of standard and classical authors is encouraged by the instructors in ancient and modern languages, history, philosophy, etc.;—and examinations are held from time to time in order that the scholar may receive credit on the record books of the university for work which is thus carried on independently of the class-room recitations. Such reading is often found profitable in the long vacation of summer. A wider acquaintance with good writers may thus be attained than it is possible to secure in the ordinary limitations of a class; individual tastes may to some extent be followed in the selection of books, and a degree of proficiency may be acquired which will tend to give the student more opportunity, in term time, for work which can only be done in a laboratory or under a teacher's eye.

There is one of the combination of studies above referred to which calls for a few special words of comment,—the group preliminary to medical studies. Opportunities are here afforded to a young man, who expects at a later day to take up the study of medicine, to become proficient in laboratory work while acquiring a knowledge of German and French and continuing his general education. A course is arranged in which physics for the first year, chemistry for the second, and the biological study of plants and animals for the third year, are the dominant topics. At the close of this course the student should have become proficient in a knowledge of the physical and chemical laws which underlie the conditions of life; he should have become familiar with the structure and functions of living beings in their normal and healthy condition; he should have become skilful in the use of the microscope and other physiological apparatus; and so when he enters the school of medicine he should know that he has been well prepared for the study of disease and of its treatment, by a training in fundamental sciences, which has not only exercised his eye and

hand but has accustomed his mind to accurate habits of observation and inquiry.

This combination of studies is recommended to students after passing the full matriculation examination,—but it has so long been customary in this country for the medical colleges to receive students without requiring of them any preliminary examination whatsoever, that for a time it is thought best to receive to this course of preliminary training students who are not at their admission prepared for the full matriculation. A special examination is therefore appointed for such as wish to enter upon a three years course of scientific studies, without expecting to take the degree of bachelor of arts.

The authorities of the university are mindful that there are many persons in Baltimore who desire to avail themselves to a certain extent of the advantages of a university without becoming fully matriculated students or candidates for a degree. So far as it is possible without interfering with the requirements of regular students and with the necessary engagements of the professors, the effort has been made to extend the university influence in this community, by lectures given in Hopkins Hall, by teachers' classes, and by occasional courses in different parts of the city. It may not be as well known that students who can give good evidence of being fitted to profit by the lessons here given are permitted to receive instruction in those branches which they are ready to pursue. There is an obvious danger in this permission, against which the faculty must be on its guard. A youth is often disposed to avoid that which seems to him "hard," and to choose an easy path; or, sometimes, he only cares to be enrolled in a respectable college without having any desire to study. It is not for such cases that this permission is designed. Nor is it intended to imply that, as a general rule, the study of one or two subjects is the proper way of acquiring a liberal education. Nevertheless, experience shows that there are in every community some who are not able, for one reason or another, to pursue a prolonged and systematical plan of instruction, but who have decided talents and are disposed to make good attainments in a more limited sphere. To such as these the door of the Johns Hopkins University has never been closed; indeed, among the students of this class, many young men of excellent ability and promise have been found,

and some who began as "special students" have afterwards matriculated and graduated with honor.

The charges for tuition are lower than is customary in institutions of corresponding rank, being forty dollars for each half year. The only additional fees are those required in the laboratories for materials consumed. The founder of the university requested that scholarships should be awarded to young men from Maryland, Virginia, and North Carolina who are found worthy, and accordingly such scholarships yielding free tuition are annually open to those who wish for this aid in the prosecution of their studies. Seventy persons have already enjoyed this advantage. The trustees have extended this privilege to residents of the District of Columbia.

Parents at a distance are sometimes afraid to send their sons to a city. If they will take the pains to inquire they will ascertain that most of the temptations to which youth are exposed may be found in the neighborhood of country colleges as well as in large towns. Wherever young men are congregated they need to be on their guard against open as well as insidious allurements by which their physical, intellectual, and moral natures may be impaired for life; and every right-minded teacher must feel the responsibility of guiding those who come under his influence in the paths of rectitude. But the arrangements of the Johns Hopkins University are favorable to good conduct. The students dwell in families resident in widely separated parts of the city. They are governed by the social, moral, and religious influences of the homes to which they belong. While assembled in the university they are brought into constant relations with their teachers. An attractive library is open to them without interruption all the day long. There are gymnasiums, not very far distant, to which they may resort for physical culture and entertainment. There are numerous societies and clubs to many of which the teachers belong. All these circumstances have been favorable, it is believed, not only to the preservation of good order, but to the formation of good habits.

The Johns Hopkins University is an unsectarian foundation. Like the city in which it is placed, it includes among its members those whose opinions and beliefs are widely divergent. But it is not an irreligious foundation because it assumes no distinctive

name. It inculcates the love of truth, not only in the daily relations of man to man, but in the defence of opinions, in the prosecution of research, and in the formation of mental habits. It insists upon uprightness of conduct in all its members. Yet in accordance with the usages of other well known colleges, which commonly bear denominational names, it lays down no test or creed for the assent of students or professors. The trustees have expressed a desire to see the university pervaded by a spirit of enlightened Christianity; the ethics taught is Christian ethics; the daily religious service is Christian worship; but the abundance and diversity of churches in this community make it quite inexpedient for the university to become identified with any one religious body. Its officers and students are of many denominations, and maintain the relations which their own consciences approve.

The number of students from Baltimore who have availed themselves of the privileges of the Johns Hopkins University is two hundred and four. Of this number, sixty-nine entered as graduate students, sixty-nine have followed courses as matriculates, and sixty-six as undergraduate special students. Twenty-nine of the matriculates have already gone forward to the degree of bachelor of arts after passing the requisite examinations.

A considerable number of these recent graduates still remain here and are pursuing their studies in languages, science, history, etc., in order that they may be fitted for the degree of doctor of philosophy, for which they can become candidates; or that they may be better qualified for the professional studies which they expect to take up. Four who were undergraduates a few years ago have already been appointed fellows, which is the highest honor bestowed by the university upon a student. Others have entered upon the professional study of law, medicine, or theology, and others are engaged in teaching or in business.

F.

List of Foreign Correspondents.

The following list gives the names of the foreign societies and journals with which a regular exchange of publications is made by the university. (See page 69).

GERMANY AND AUSTRIA.

- Berlin. Königliche akademie der wissenschaften.
 Deutsche chemische gesellschaft.
 Jahrbuch über die fortschritte der mathematik.
 Journal für reine und angewandte mathematik. (Crelle.)
- Cassel. Verein für naturkunde.
- Cöthen. Chemiker zeitung.
- Gießen. Jahresbericht über die chemie und physik.
- Göttingen. Königliche gesellschaft der wissenschaften.
- Heilbronn. Literaturblatt f. germ. u. rom. philologie.
- Jena. Jena'sche zeitschrift für naturwissenschaften.
- Leipzig. K. Sächsische gesellschaft der wissenschaften.
 Archiv der mathematik und physik. (Grunert.)
 Jahrbücher f. classische philologie.
 Liebig's annalen der chemie. (Wöhler, Kopp.)
 Mathematische annalen. (Clebsch.)
 Zeitschrift für mathematik und physik. (Schlömilch.)
 Zeitschrift für krystallographie und mineralogie.
 Zoologischer anzeiger.
- Munich. Königliche akademie der wissenschaften.
- Strassburg. Zeitschrift für physiologische chemie.
- Trieste. *Klass.*
- Tübingen. Jahresbericht für reine chemie.
- Vienna. K.-k. akademie der wissenschaften.
- Wiesbaden. Zeitschrift für analytische chemie. (Fresenius.)

FRANCE AND SWITZERLAND.

- Cherbourg. Société nationale des sciences naturelles et mathématiques.
- Paris. Institut de France: Académie des sciences.
 Bureau des longitudes.
 École normale supérieure.
 École polytechnique.
 Observatoire de Paris.
 Société chimique de Paris.
 Société mathématique de France.
 Annales de chimie et de physique.
 L'astronomie.
 Bulletin des sciences mathématiques et astronomiques.
 Journal de mathématiques pures et appliquées.
 Nouvelles annales de mathématique.
 Revue internationale de l'enseignement.
 Revue politique et littéraire.
 Revue scientifique.
- Bern. Schweiz. gesellsch. für die gesammten naturwissenschaften.
- Zurich. Société helvétique des sciences naturelles.

BELGIUM AND HOLLAND.

- Brussels. Académie des sciences de Belgique.
Annales du bibliophile.
Ghent. Mathésis.
Archives de biologie.
Leyden. Nederlandsche dierkundige vereeniging.
Recueil des travaux chimiques des Pays-Bas.
Liège. Société royale des sciences.
Louvain. Le musée.

ITALY; SPAIN AND PORTUGAL.

- Milan. Istituto Lombardo di scienze e lettere.
Annali di matematica pura ed applicata.
Naples. Giornale di matematiche.
Zoologische station zu Neapel.
Palermo. Gazzetta chimica Italiana.
Rome. Reale accademia dei lincei.
Turin. Reale accademia delle scienze.
Archives Italiennes de biologie.
Venice. Reale istituto Veneto.
Coimbra. Jornal de ciencias mathematicas e astronomicas.
Madrid. Novedades científicas.

GREAT BRITAIN AND IRELAND.

- Cambridge. Philosophical society.
Dublin. Trinity college.
Edinburgh. Royal society.
London. Royal society.
Royal astronomical society.
Mathematical society.
Chemical society.
Society of telegraph engineers.
Royal institution of Great Britain.
Society of chemical industry.
Chemical news.

DENMARK AND NORWAY; RUSSIA AND FINLAND.

- Copenhagen. Royal academy.
Tidskrift for matematik.
Christiania. Archiv for matematik og naturvidenskab.
University of Christiania, publications.
St. Petersburg. Académie impériale des sciences.
Helsingfors. Société des sciences de la Finlande.

GREECE.

- Athens. *Ηερασεύς*.

BRITISH INDIA.

- Calcutta. Asiatic society of Bengal.

JAPAN.

- Tokio. University, publications of scientific department.

AUSTRALIA.

- Sydney. Royal society of New South Wales.

MEXICO.

- Mexico. Revista científica Mexicana.

BRAZIL.

- Rio de Janeiro. Observatoire impériale.

G.

Report of the Chesapeake Zoölogical Laboratory.

FOR THE FIFTH YEAR.

Summer of 1882, Beaufort, N. C.

To the President of the Johns Hopkins University:

DEAR SIR: In accordance with your request, I have the pleasure to submit the following report of the fifth session of the Chesapeake Zoölogical Laboratory.

The laboratory was opened for work at Beaufort, N. C., on May 1, 1882, and was closed on September 29, after a session of twenty-two weeks.

The following is a list of the scientific workers of the party:

W. K. Brooks, *Director.*
 E. B. Wilson, *Assistant.*
 H. L. Osborn, *Fellow J. H. U.*
 H. W. Conn, *Graduate Student J. H. U.*
 J. M. Tyler, *Prof. of Natural Science, Amherst College.*
 J. Pillsbury, *Prof. of Natural Science, Springfield, Mass.*
 J. M. Wilson, M.D., *Ann Arbor, Mich.*
 Francis Winslow, *Lieut. U. S. N., U. S. Fish Commission.*

Abstracts of the more important investigations have already been printed in the University Circulars, and in the *Zoölogischer Anzeiger*, and more extended accounts are now in preparation for publication.

The following subjects, among others, have been investigated:

Dr. E. B. Wilson has completed his study of the anatomy, histology, and embryology of *Renilla*, and I hope that his paper on this subject will soon be published. The work has fully occupied him and Prof. Mitsukuri for three years, and his results, which are of the greatest interest to science, cover so much ground that it is impossible to state them here. He was able this summer to fill all the gaps in his previous work, since he succeeded in obtaining an ample supply of material.

He also obtained the eggs and young of a closely allied form, *Leptogorgia*, and, by tracing its life history, secured the data for a comparison between *Renilla* and other compound polyps. As the great number and cost of the engravings render the publication of this paper in this country almost impossible, Dr. Wilson has taken his specimens and drawings to Europe, in order to find means for publication there. He also hopes to complete his work by studying, in the Naples Aquarium, the embryology of *Pennatula*, a form which can only be obtained on our coast by deep-sea dredging.

Incidentally to this work, Dr. Wilson has published this summer a paper on "Variation in the Early Stages of the Development of *Renilla*," a subject which he investigated this season, with the help of J. M. Wilson and H. L. Osborn.

Lieut. Winslow and I devoted nearly two months to oyster propagation, and made discoveries which enable us to rear oysters from the egg much more rapidly and with greater certainty than has been possible before; and although we have not yet succeeded in keeping the young oysters until they attach themselves, our experience this year will enable us to construct an apparatus which we have every reason to believe will accomplish this purpose. Our station at Beaufort is so remote from all mechanical resources and appliances that we were not able to construct this apparatus; but we hope to be able to take it with us and put it into operation early next spring.

Mr. Osborn has studied the growth of the shell of the oyster by placing small circles of microscopic glass between the mantle and the shell of the living oyster, and removing them at short intervals to examine the manner in which the new shell is deposited on the glass. He has also been able to make interesting observations upon the rate of growth of the oyster.

His researches on this subject show that, within six weeks after it attaches itself, the oyster may, under favorable circumstances, grow to the length of an inch, or even more. The oysters upon which he experimented were not reared from the egg, but were caught in the open water by a spat-collector.

Mr. Osborn has also studied the anatomy of *Balanoglossus*, and he expects to continue this work through the winter in Baltimore.

Mr. Conn spent most of the summer tracing the life histories of crabs, and obtained many novel and interesting results.

He also studied the development of the embryo of *Tubularia* (*Parypha*) *cristata*, and has an illustrated paper on this subject now ready for publication. His researches show that the published accounts of the embryology of *Tubularian* hydroids are incorrect.

Mr. Conn has also demonstrated, by feeding with colored particles, the occurrence of intra-cellular digestion in *Tubularia*.

He has also made a very thorough study of the embryology of a *Gephyrean* worm, *Thalassima*, but another season at the sea-shore will be necessary to complete this work.

Dr. J. M. Wilson has carried on a series of experiments to test the statement that the eggs of *Sea-Urchins* may develop parthenogenetically, and his results seem to show that the statement is untrustworthy.

My own chief work has been the study of the *hydro-medusae* of Beaufort, and a monograph on this subject is now in preparation.

I have added a number of new forms to my list this summer, and have traced the life histories of several others. I have also verified Metsch-

nickoff's account of the delamination of the egg of *Liriope*; and McCrady's account of the development of the parasitic larva of *Cunina* within the bell of *Turritopsis*.

As regards my work on the *Macroura* of Beaufort, I have added a number of new facts, and now have ready for publication an account of the life history of *Alpheus minus*; an account of *Alpheus heterochelis*; and of *Penaeus Braziliensis*. The latter is of especial interest, since I have been able to verify, by actually rearing captive isolated specimens, Fritz Müller's classical memoir on this subject.

Among the more interesting new forms which we have added this year to the fauna of our continent, I may mention *Pedicellina* and *Loxosoma*.

Yours respectfully,

W. K. BROOKS.

II.

List of Donors to the Library, September 1, 1881, to September 1, 1882.

- ARCHAEOLOG. INST. OF AMERICA. Papers. Classical Series I. Boston. O.
 BRINTON, D. G., M.D. (Author). Books of Chilan Balam. Philadelphia. O.
 BRANDT, H. G. C. Preussische Siegeslieder. Heilbronn. D.
 BLAKE, E. W. (Author). Solution of the Pyramid Problem. New York. O.
 BALLARD, R. (Author). Aerodynamics. New Haven. O.
 CORDELL, E. F., M.D. Transactions of Medical and Chirurgical Faculty of Maryland. Baltimore. O.
 CENTURY CO. Selected proofs from Scribner's Monthly. New York. F.
 CARPENTER, PROF. W. H. (Editor). Nikolastrapa Halls Prests. Halle. O.
 Olafsson, A. Authfredi. Copenhagen. O.
 Olafsson, A. Skirnir. Copenhagen. O.
 COOK, G. H., State Geologist, N. J. Annual Report, 1881. Trenton. O.
 CASEY, J. (Author). Sequel to the First Six Books of Euclid. London. D.
 COMMISSIONERS OF PUBLIC SCHOOLS. Baltimore. Report for 1881. Baltimore. O.
 COMEY, J. P. (Author). Memoir of J. M. Clayton. Wilmington. O.
 CONVERSE, J. H. Subject Index to Library of Baltimore Bar. Baltimore. O.
 DALLAS, E. J. (Compiler). Street Directory of Principal Cities of the United States. Washington. O.
 DENNY, H. G. Massachusetts State Record. 5 Vols. Boston. O.
 EYRE AND SPOTTISWOODE. (Publishers). Variordin Teacher's Bible. London. O.
 ELY, R. T. Statistisches Jahrbuch d. Stadt Berlin. Berlin. O.
 GILMAN, PREST, D. C. Boerhaave Aphorismi. Leyden. D.
 GREEN, S. A., M. D. Reports, Record Commissioners of Boston. 4 Vols. Boston. O.
 JEROME, GOV., D. H. Geological Survey of Michigan. Vol. IV. New York. O.
 MARTIN, PROF. H. N. (Author). Handbook of Vertebrate Dissection. New York. D.

- MCDANOLDS, J. S. *New Jersey Archives*. 4 Vols. O.
MORRIS, PROF. C. D. *Milton's Paradise Lost*. Edited by R. Bentley. London. Q.
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1876-1882.

The following list includes books and articles published by members of the Johns Hopkins University, written during the connection of the author with the university, or based on work carried on while here. Other papers written by holders of Fellowships are also given. The graduating theses of the doctors of philosophy are also included.

The work of non-resident lecturers is not included.

The journals, etc., issued under the auspices or with the aid of the university, are indicated in the list by the following abbreviations:

American Journal of Mathematics,	- - -	<i>Math. Jour.</i>
American Chemical Journal,	- - -	<i>Chem. Jour.</i>
American Journal of Philology,	- - -	<i>Philol. Jour.</i>
Studies from the Biological Laboratory,	- - -	<i>Biol. Studies.</i>
Journal of Physiology,	- - -	<i>Jour. of Physiol.</i>
Contributions to Logic,	- - -	<i>Logical Contributions.</i>
Studies in Historical and Political Science,	- - -	<i>Hist. and Pol. Studies.</i>
Johns Hopkins University Circulars,	- - -	<i>Univ. Circulars.</i>

Where an article has appeared in more than one of the journals above named, its principal place of publication alone is generally given. As a full index of the abstracts of scientific papers in the University Circulars has recently appeared, only a portion of the papers there published are here noted.

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This Report covers the Academic year ending September 1, 1882. The Appendix contains some statements of a more recent date.

Issued November 11, 1882.

EIGHTH ANNUAL REPORT

OF THE PRESIDENT OF THE

JOHNS HOPKINS UNIVERSITY

Baltimore, Maryland

1883

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Otto Luger,	<i>Curator of the Biological Museum.</i>

EIGHTH ANNUAL REPORT

OF THE PRESIDENT OF THE

Johns Hopkins University

Baltimore Maryland

1883



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EIGHTH ANNUAL REPORT.

To the Trustees of the Johns Hopkins University :

In the report of this university presented a year ago, there was an extended statement of the principles which had been observed and of the results which had been reached in the development of our work from 1876 to 1882. The following year, which closed on the first of September, 1883, has been one of prosperity and growth. All the chief departments of investigation and instruction hitherto established have been maintained with fidelity and success. Some new subjects have been introduced. The number of teachers and of students has increased, the buildings have been enlarged, the books and apparatus have been added to, and the recognition which the university has received at home and abroad has been more encouraging than ever.

During the summer vacation I had the pleasure of visiting a number of foreign universities, and of learning something of the recent progress of education in England and on the continent. Wher-

ever I went, it appeared that one department or another of our work was well known to scholars. The subject of medical education and the management of hospitals, especially in their relations to medical teaching, occupied much of my attention, and I owe a public acknowledgment to gentlemen in London, Oxford, Cambridge, Manchester, Leyden, Amsterdam, Bonn, Heidelberg, Freiburg, Zurich, and Paris, for information, suggestions and printed statements pertinent to this and to other branches of university administration. In different lands, the principles of superior education are under discussion, and earnest efforts are making to improve existing methods for the promotion of knowledge and the training of scholars. In some places our progress is watched with attention and expectation. At home during the past year our methods have been subjected to the closest scrutiny.

Under all these circumstances, I have been more than ever impressed by a sense of the responsibilities which rest upon those who are guiding this new institution. We are not only bound to have good intentions; we must have wisdom; and in order that we may be wise we must continually study the opinions of the most enlightened men in the most enlightened universities at home and abroad. Many years ago a celebrated English scholar, referring to the weighty office of those

"on whom it falls to found and put in action new institutions of liberal education, intended to meet the requirements of present and future ages," declared that "those who are engaged in this task must act as men building for eternity." As we notice in our seven years history, how rapidly ways become customs, and customs, laws; and observe in the old world, how hard it is to depart from laws once put in force; the words of Whewell, which have just been quoted, will hardly seem too strong.

We continue to maintain the principle that the chief function of a university is to develop the character of its students, by bringing them into personal relations with leaders in the different branches of knowledge. Instruction by books, by correspondence, or by telephone, can never accomplish what is attained by the encounter, face to face, of a master and his scholars. Nor can intellectual be separated from moral character. Strong, true, learned, faithful, honest teachers, will make of their pupils well developed men, and these men will become leaders in professional life, scholars, writers, investigators, thinkers, philosophers, or men of affairs, according to their inborn gifts and the power of will which they firmly apply in their several vocations. The training of all that is spiritual and humane, the steady and harmonious unfolding of the minds of youth, under the friendly

observation and suggestions of a teacher, are therefore of paramount importance in our work.

But almost inseparable from this function of the University, is the duty of advancing human knowledge, and of bringing before the world the results of continued thought upon important themes. It is natural and right that the public should look to universities for light. All man's inheritance from the past, language, literature, politics, religion, should be studied, that none of the dearly bought experience of the race may be lost. Liberal means should also be provided for the prosecution of all the branches of scientific research. The results of such investigations should be communicated to the world by lectures, books, and memoirs, and the university should encourage the printing of original and important work on subjects too recondite for the ordinary means of publication. In this work of investigation and research, every university should take some part, and indeed the amount of its contributions to the general stock is not an unfair measure of its force. This university desires to do its part for the advancement of knowledge. While providing the incentives of association and opportunity, of books, instruments, laboratories, and the means of printing,—it also brings to bear upon all its staff the obligation of Duty, the duty of liberally educated men to do all they can for the good of mankind.

The phrase "promotion of research," which it is the fashion to employ in these days, meets with an opposition which was never encountered by the phrase "advancement of knowledge," and yet both phrases mean the same thing. It requires but a very slight acquaintance with the times in which we live, to see that the progress of modern civilization is due to the use of scientific methods, and that innumerable problems pertinent to the highest welfare of the human race remain unsolved because they have never been studied in this painstaking way.

From these preliminary considerations I pass to a report of the current year, beginning with the work of instruction of graduate and undergraduate students. Those who are disposed to look into these subjects more closely are reminded that, for the information of the public, detailed statements of the work here in progress are constantly printed in our official Circulars.

NUMERICAL STATEMENTS.

Classes have been taught in the various branches of higher mathematics, in chemistry and mineralogy, physics, biology, (including physiology and comparative anatomy); in history, political economy, ethics, logic, and psychology; in Greek, Latin, Hebrew, Sanskrit, French, Italian, Spanish,

German, Anglo-Saxon, and English. Sixteen young men completing their courses of study, and passing the requisite examinations, have come forward to take their degrees.

The academic staff included during the year forty-one teachers, four of whom were non-resident lecturers. The number of students enrolled during the year was two hundred and four, of whom one hundred and six were residents of Maryland, and ninety-one came here from twenty-eight States of the Union, and seven from foreign countries. Among the students were one hundred and twenty-five already graduated, coming from sixty-seven colleges and universities; there were forty-nine matriculates, (or candidates for the degree of bachelor of arts), and there were thirty admitted as special students, to pursue courses of study for which they seem fitted, without reference to possible graduation. The attendance upon the public lectures (not including those in French) averaged one hundred and forty-eight,—ascertained by the count of the doorkeeper. The number of students at the opening of the present academic year is two hundred and thirty-three, of whom one hundred and forty-eight are already graduates.

The following table indicates the enrollment of students in each year since the university was opened in the autumn of 1876:

	Graduates, (incl. Fellows.)	Matriculates.	Non- Matriculates.	Total Enrolled.	Average attend- ance at Public Lectures.
1876-77	54	12	23	89	60
1877-78	58	24	22	104	84
1878-79	63	25	35	123	96
1879-80	79	32	48	159	118
1880-81	102	37	37	176	186
1881-82	99	45	31	175	137
1882-83	125	49	30	204	148
*1883-84	148	52	33	233	

* As shown by the preliminary list at the opening of the academic year.

The attendance upon some of the principal courses during the last five years has been as follows :

	1878-79.	1879-80.	1880-81.	1881-82.	1882-83.
Mathematics,	38	31	31	33	35
Physics,	32	38	35	42	50
Chemistry,	39	46	40	44	49
Biology,	26	32	25	32	30
Greek,	40	36	31	33	44
Latin,	27	40	40	39	41
German,	55	60	55	47	50
French, Italian, etc., .	18	39	33	26	31
English,	*	19	29	22	45
History and Polit. Sci.,	19	33	40	40	64
Logic,	6	16	13	9	14
Philosophy and Ethics,	6	12	14	22	47

* Not recorded.

From the printed registers of the last seven years, it appears that five hundred and thirty-seven individuals have been here enrolled as

students, of whom two hundred and eighty-five have come from Maryland, (including two hundred and thirty from Baltimore), and two hundred and fifty-two from thirty-nine other states and countries. Of this number three hundred and thirty persons pursued courses as graduate students and two hundred and seven as collegiate students.

MATHEMATICS.

The subject of mathematics has received great encouragement from the Trustees ever since the university was opened. As there are reasons for anticipating the withdrawal from our staff of Professor Sylvester,* the leader in this work, it may be of interest at the present time to recall the subjects which have here been taught since he came among us.

Of those who have held fellowships two are on the staff of instructors of this university, eight received appointments at other universities and colleges, two are filling positions in the scientific bureaus of the U. S. government at Washington, and one is teaching in a private school. This includes all the former fellows in mathematics. Of the former graduate students, not fellows, two at least have been appointed to collegiate profes-

* His resignation was accepted by the Trustees October 1, 1883. In December following he was appointed Savilian Professor of Geometry in the University of Oxford.

sorships. The Mathematical Seminary has held monthly meetings since October, 1878, and the graduate students, more particularly the fellows, have taken an active part in its proceedings, the papers read by them generally indicating a high order of ability and mastery of the subject under discussion. Since November, 1879, abstracts of thirty-five such communications have been published in the University Circulars, viz: eleven in 1879-80, seven in 1880-81, six in 1881-82, and eleven in 1882-83. In addition to this, former fellows and scholars have published, since their first connection with the university, forty-six mathematical papers in various periodicals.

Dr. Story, Associate Professor, has furnished me with the following additional statement:

COURSES OF INSTRUCTION, HOURS PER WEEK, AND ATTENDANCE, 1876-88.

Graduate Courses.

- Determinants and Modern Algebra: Professor Sylvester, 1876-77, 2d half-year, 2 hrs., (7); 1877-78, 2 hrs., (5); 1878-79, 2 hrs., (8).
- Theory of Numbers: Professor Sylvester, 1879-80, 2 hrs., (8); 1880-81, 2 hrs., (6); 1881-82, 1st half-year, 2 hrs., (7).
- Theory of Partitions: Professor Sylvester, 1882-83, 2d half-year, 2 hrs., (10).
- Algebra of Multiple Quantity: Professor Sylvester, 1881-82, 2d half-year, 2 hrs., (12); 1883-84, 1st half-year, 2 hrs., (6).
- Theory of Substitutions: Professor Sylvester, 1882-83, 1st half-year, 2 hrs., (9).
- Algebraical Geometry and Abelian and Theta Functions: Professor Cayley, 1881-82, 2d half-year, 2 hrs., (14).
- Quaternions: Dr. Story, 1877-78, 2 hrs., (2); 1879-80, 3 hrs., (4); 1881-82, 3 hrs., (7); 1882-83, 2d half-year, 3 hrs., (4).
- Higher Plane Curves: Dr. Story, 1880-81, 2 hrs., (5); 1881-82, 1st half-year, 3 hrs., (1).

- Solid Analytic Geometry, (General Theory of Surfaces and Curves) :
Dr. Story, 1881-82, 2d half-year, 8 hrs., (1); 1882-83, 1st half-year, 8 hrs., (6).
- Theory of Geometrical Congruencies: Dr. Story, 1882-83, 2d half-year, 2 hrs., (4).
- Modern Synthetic Geometry: Dr. Franklin, 1877-78, 2 hrs., (2).
- Theory of Invariants: Dr. Story, 1882-83, 10 lectures, (8); 1883-84, 8 hrs., (6).
- Determinants: Dr. Franklin, 1880-81, 1st half-year, 2 hrs., (9); 1882-83, 20 lectures, (9).
- Modern Algebra: Dr. Franklin, 1880-81, 2 half-year, 2 hrs., (6); 1881-82, 2d half-year, 2 hrs., (6).
- Elliptic Functions: Dr. Story, 1878-79, 2 hrs., (2); 1879-80, (continuation of the previous year's course), 8 hrs., (4); Dr. Craig, 1881-82, 8 hrs., (8); 1883-84, 8 hrs., (4).
- Elliptic and Theta Functions: Dr. Craig, 1882-83, 8 hrs., (10).
- General Theory of Functions, including Riemann's Theory: Dr. Craig, 1879-80, 80 lectures, (2); 1880-81, 1st half-year, 8 hrs., (3).
- Spherical Harmonics: Dr. Craig, 1878-79, 10 lectures, (6); 1879-80, 20 lectures, (6); 1881-82, 1st half-year, 2 hrs., (4).
- Cylindric or Bessel's Functions: Dr. Craig, 1879-80, 10 lectures, (2).
- Partial Differential Equations: Dr. Craig, 1880-81, 2d half-year, 2 hrs., (5); 1881-82, 2d half-year, 8 hrs., (9); 1882-83, 2d half-year, 2 hrs., (2).
- Calculus of Variations: Dr. Craig, 1879-80, 12 lectures, (9); 1881-82, 1st half-year, 2 hrs., (8); 1882-83, 1st half-year, 2 hrs., (6).
- Definite Integrals: Dr. Craig, 1876-77, 1st half-year, 8 hrs., (5); 1882-83, 1st half-year, 2 hrs., (2).
- Mathematical Astronomy: Dr. Story, 1877-78, 8 hrs., (2); 1882-83, 8 hrs., (2); 1883-84, 8 hrs., (2).
- Elementary Mechanics: Dr. Craig, 1876-77, 2d half-year, (8).
- Statics: Dr. Franklin, 1882-83, 2d half-year, 8 hrs., (6).
- Analytic Mechanics: Dr. Craig, 1877-78, 1st half-year, (6); Dr. Story, 1880-81, 2d half-year, 2 hrs., (6); Dr. Craig, 1881-82, 1st half-year, 8 hrs., (8); 1882-83, 1st half-year, 8 hrs., (4); Dr. Franklin, 1883-84, 8 hrs., (6).
- Theoretical Dynamics: Dr. Craig, 1878-79, 15 lectures, (6); 1883-84, 2 hrs., (5).
- Mathematical Theory of Elasticity: Dr. Story, 1876-77, 2d half-year, 2 hrs., (4); 1877-78, 2 hrs., (2); Dr. Craig, 1881-82, 8 hrs., (4).
- Hydrodynamics: Dr. Craig, 1878-79, 24 lectures, (7); 1880-81, 1st half-year, 2 hrs., (6); 2d half-year, 4 hrs., (8); 1882-83, 2d half-year, 8 hrs., (5).
- Mathematical Theory of Sound: Dr. Craig, 1883-84, 8 hrs., (5).

Undergraduate Courses.

Conic Sections: Dr. Story, 1876-77, 1st half-year, 5 hrs., (6); 1877-78, 4 hrs., (5); Dr. Franklin, 1878-79, 3 hrs., (5); 1879-80, 3 hrs., (5); Dr. Story, 1880-81, 3 hrs., (8); 1881-82, 1st half-year, 3 hrs., (6); 1882-83, 2d half-year, 3 hrs., (9); 1883-84, 2 hrs., (14).

Higher Plane Curves: Dr. Story, 1876-77, 2d half-year, 5 hrs., (6); 1878-79, 1st half-year, 3 hrs., (6); 1879-80, 1st half-year, 4 hrs., (5); 1880-81, 2d half-year, 3 hrs., (8); 1881-82, 2d half-year, 3 hrs., (8); 1882-83, 1st half-year, 3 hrs., (3); 1883-84, 2 hrs., (2).

Solid Analytic Geometry: Dr. Story, 1878-79, 2d half-year, 3 hrs., (7); 1879-80, 2d half-year, 4 hrs., (4); 1880-81, 2d half-year, 4 hrs., (6); Dr. Franklin, 1881-82, 1st half-year, 3 hrs., (4); 1882-83, 1st half-year, 3 hrs., (6); 1883-84, 2d half-year, 3 hrs.

Differential and Integral Calculus: Dr. Craig, 1876-77, 5 hrs., (5); Dr. Franklin, 1877-78, 3 hrs., (4); 1878-79, 3 hrs., (12); 1879-80, 3 hrs., (9); 1880-81, 3 hrs., (6); 1881-82, 3 hrs., (9); 1882-83, 1st half-year, 5 hrs., (12); 1883-84, 3 hrs., (16).

Differential Equations: Dr. Craig, 1877-78, 3 hrs., (4); Dr. Story, 1878-79, 2 hrs., (5); 1879-80, 3 hrs., (8); Dr. Franklin, 1880-81, 2d half-year, 3 hrs., (4); 1881-82, 1st half-year, 3 hrs., (5); 1882-83, 2d half-year, 3 hrs., (9); 1883-84, 2 hrs., (6).

Theory of Equations and Determinants: Dr. Story, 1876-77, 2 hrs., (7); Dr. Franklin, 1877-78, 2 hrs., (1); 1878-79, 2 hrs., (1); 1879-80, 2 hrs., (6); 1880-81, 2 hrs., (5); 1881-82, 2d half-year, 3 hrs., (8); 1882-83, 2d half-year, 3 hrs., (8); 1883-84, 1st half-year, 3 hrs., (9).

Problems: Dr. Story, 1880-81, 1 hr., (4).

Teachers' Class in the Theory of Numbers: Dr. Story, 1879-80, 10 lectures, (24).

The work of the past academic year and the programme for the new year are included in the foregoing statement. The entire record confirms the wisdom of the Trustees in calling to this university, at the beginning, in a chair devoted to a fundamental subject, a teacher so renowned and so capable of drawing around him a company of superior associates and pupils.

PHYSICS.

Although the apartments here devoted to physical studies are not as large nor as conveniently arranged as they should be, the work which has been accomplished is remarkable. The university is provided with costly apparatus, much of it especially designed for research, and with the means of making new instruments as they may be devised and required. Professor Rowland has also had a large margin of time, beyond the duties positively required of him, for the prosecution of investigation, and he has been supported by an able associate, Dr. Hastings, and by competent assistants. During the past year he has continued the study of the solar spectrum by means of the concave gratings which he devised and caused to be made during a previous year in our mechanics' shop. A few of these gratings have been given away to distinguished physicists in this and other countries, and a few have been sold. Mr. Rowland has been largely occupied with photographing the spectrum, and the results of this work are likely to be given to the public at an early day in the form of a new map of the spectrum. The photographs of the spectrum so far made, extend down to B, the original negatives being about $\frac{2}{3}$ the scale of Angström's map from B to b, equal to Angström's from b to G, and $1\frac{1}{2}$ Ang-

ström's from G to the extreme ultra violet. They show 150 lines between the H lines and give the 1474 and b_3 and b_4 widely double, and the E line indistinctly double.

In October, 1882, with the consent of the Trustees, he went to Paris, as a delegate appointed by the government to represent the United States in the International Commission of Electricians convened under the auspices of the French republic; and since his return, he has been requested by Mr. Frelinghuysen, Secretary of State, to undertake a new determination of the value of the ohm, in accordance with the plan of co-operative investigation decided on by the International Commission. The expense of this inquiry will be met by an appropriation from the national treasury, but the Johns Hopkins University has liberally favored the research and has allowed the use of the building at Clifton, as well as of other conveniences in town. Under Prof. Rowland, Mr. A. L. Kimball and others will be engaged in the details of this work.

Dr. Hastings has also been called into the temporary service of the government. An appropriation having been secured from Congress for observing the solar eclipse of May 6, 1883, on the Caroline Island, he was requested to become one of the astronomical party. Leave of absence was granted to him by the Trustees, and his place

during the rest of the session was supplied by Mr. J. Rendel Harris. The scientific results of this expedition will be published elsewhere,—but it should here be mentioned that Dr. Hastings directed his attention to the Sun's corona,—and was led to entertain new views in regard to its nature, which will be fully stated in his formal report.

The original investigations of the year have been on these subjects :

On the photography of the solar spectrum by means of the concave gratings.

On the nature of the Sun's corona.

On the determination of the B. A. unit of electrical resistance in absolute measure.

On the determination of the specific resistance of mercury.

On the variation of the specific heat of water with the temperature.

On the relative wave lengths of the lines of the spectrum by means of the concave grating.

On the effect of difference of phase in the harmonics on the timbre of the sound.

On the variation of the magnetic permeability of nickel by change of temperature.

Lectures have been given by Professor Rowland on Electricity and Magnetism, four times weekly through the year.

The work of a part of the students has been guided by Dr. Hastings. The major course has included lectures, weekly through the year, and daily work in the laboratory, especially on Wednesdays. The minor course in General Physics has included instruction daily through the year in Elementary Mechanics, Acoustics, Heat, Magnet-

ism, Electricity, and Light, and a weekly exercise in the laboratory under Dr. Hastings and Mr. H. F. Reid. Advanced students have also taken part in meetings weekly, for the reading and discussion of the current physical journals.

CHEMISTRY.

The original laboratory for Chemistry was built in the expectation that it would be large enough for a period of five years. At the end of that time there was not room for all who wished to avail themselves of its privileges, and consequently the Trustees, on June 5, 1882, after much deliberation, decided to enlarge it. Plans were accordingly drawn and contracts made, and on the third of May, 1883, the building in its improved and extended form was completed and thrown open to public observation. It now covers an area of about fifty by one hundred feet and has three full stories and a basement. In the basement are the necessary conveniences for assaying and other furnace operations; on the first floor there are large rooms devoted mainly to qualitative and quantitative analysis; on the second, are rooms for research, for the study of the director, the library, and for lectures in General Chemistry. On the third floor are rooms for the chemical and mineralogical collections, a working and lecture-room for mineralogy and a second lecture-room for chemistry. The

entire laboratory will conveniently accommodate about ninety working students.

Advanced students have been engaged, as heretofore, in the laboratory prosecuting such daily work as seemed best adapted to their various needs. Those who had completed the full courses in General Chemistry, including from two to three years' work in qualitative and quantitative analysis and about a year's work in making difficult and instructive preparations, were encouraged to undertake the solution of original problems, and the following investigations were completed during the year. Others are in progress.

On the conduct of moist phosphorus and air towards carbon monoxide.

White phosphorus.

Oxidation of a compound containing the sulphamine and propyl groups in the ortho position with reference to each other, showing protection of the propyl.

Oxidation of paradipropylbenzene-sulphamide, showing protection of the propyl.

On the nature of sinapic acid.

The influence of light on fermentation.

Chemical examination of minerals from the neighborhood of Jones's Falls.

The results of these investigations have either already been or will soon be published in the *American Chemical Journal*. Some have also been brought before the Johns Hopkins Scientific Association at its regular meetings.

At the beginning of the year, subjects for historical study were assigned to the Fellows and others, and a course of twenty lectures was the result. These were thoroughly worked up from the original articles in the journals, and not from

works on the history of chemistry. Full abstracts of these lectures, together with complete references to the articles consulted, are to be prepared and preserved in the chemical library. Such inquiries were much facilitated by the excellent collection of chemical journals and other works which is constantly accessible.

The lectures given were as follows:

Three by Professor Remsen on "Valence";
Two by Mr. E. H. Keiser on "The History of Ozone";
Two by Mr. D. T. Day on "The Electro-Chemical Theory";
Four by Mr. W. C. Day on "Avogadro's Hypothesis";
Three by Mr. H. N. Stokes on "The Idea of the Radical in Chemistry";
Three by Dr. J. R. Duggan on "Fermentation";
Three by Dr. R. D. Coale on "The Investigations which led to our present Conceptions of Substitution."

The regular instruction in chemistry for undergraduates has been given upon the following schedule. The laboratory work has been directed by Professor Remsen, Dr. Morse, and Dr. Coale. The lectures on general chemistry (non-metals) were given daily during the first half-year by Professor Remsen, and by Dr. Morse, during the remainder of the session. During the last half of the year Professor Remsen lectured on the chemistry of the carbon compounds. In mineralogy during the first half-year, Dr. Morse gave instruction by lectures and practical exercises three times weekly and subsequently this work was continued by Dr. G. H. Williams, whose courses are to be given,

with improved facilities, during the year now opening.

Advanced students have also taken part in meetings held twice weekly through the year for the purpose of reporting on the current journals of chemistry. All the important journals were carefully read, and the articles then fully reported on. Not only the teaching staff, but the fellows and other advanced students, worked in this direction throughout the year.

BIOLOGY.

When they determined to enlarge the Chemical Laboratory, the Trustees also decided to construct a separate building for Biology. The plans were drawn by Mr. C. L. Carson, Architect, in accordance with the wishes of the Professor of Biology and the directions of the Trustees. The building was commenced in the spring of 1882, and at the date of this report is ready to be occupied.

The size of the rooms, their light, ventilation, apparatus, and furniture, give ample facilities for the study of physiology and comparative anatomy, in accordance with the best known methods, and the scientific power of the university is much increased by this addition to its material resources. The significance of this laboratory in relation to medical education is obvious. Students expecting at a later day to take up the courses in medicine,

may here acquaint themselves, not only with the use of the microscope and the modern instruments of physiological research, but may also have ample opportunities to study the normal and healthy forms and functions of living beings, before proceeding to the study of disease and its treatment. The work of such students in their second year in the laboratory includes a thorough systematic drill in Animal Physiology, with especial reference to the human body.

Description of the new Biological Laboratory.

The building stands upon the corner of Eutaw and Little Ross streets, fronting toward the Chemical Laboratory, and occupies an area of eighty-five by fifty-three feet. It is three stories high, and has in addition a basement which is entirely above ground.

The façades are treated in an adaptation of the English renaissance style, with simple and severe details, and constructed of pressed brick, with sill and band courses, trimmings to doorways, etc., of Cheat river blue-stone. Terra cotta panels and spandrels and moulded brick bands are also appropriately distributed throughout the design. The interior is fitted up in a simple and substantial manner, well adapted for the various uses to which the building is put. The large rooms are cased with hard cement to 2½ feet from the floor, and the floors laid with Seyrsel vulcanized mastic, the ceilings throughout being lined with cypress, and the wainscoting, inside trimmings, etc., being of Georgia yellow pine, all finished to display the natural grain of the wood.

The general arrangement of the interior is as follows. On the basement are large well lighted and equipped rooms for advanced work in chemical physiology and animal electricity; store rooms for chemicals and glass ware; and a furnace room containing a crematory, a boiler for preparing distilled water, and a small steam engine. The first floor contains: the general laboratory, 32 × 48 feet, for less advanced students; the main lecture room; a room for storing the reagents and material required for the daily class work; an administration room, the headquarters of the chief assistant; and a room for storing diagrams and lecture apparatus, and preparing lecture experiments. On the second floor are a museum of typical specimens such as are needed for the annual courses of instruction; a small lecture room; a library of biological books and journals; rooms

for advanced study in Botany and Comparative Anatomy; and a chamber fitted up for microphotography. The third floor is mainly given up to advanced work in Animal Physiology and Histology; but contains also the mechanic's workshop, and the director's private office.

During the past year the rooms set apart for biological work have been open eight hours daily for the prosecution of advanced study and research and for courses of practical instruction in connection with classes. Original investigations, the results of which either have been or soon will be published, have been made in the following subjects:

The direct action upon the heart of ethyl alcohol. The influence of digitaline upon the heart and blood vessels. The influence of quinine upon the blood vessels. The influence of variations in arterial pressure upon the time occupied by the systole of the heart. The minute structure of the kidney. The life-history of *Penicillium*. Viscous fermentation. The influence of various illuminations on the growth of yeast. The structure of *Porpita*. The structure of the gasteropod gill. The development of the mammary gland. The structure and properties of the cavernous tissue beneath the olfactory mucous membrane.

Papers on several of the researches carried on have been read before the Scientific Association of the University, the Maryland Medical and Chirurgical Faculty, &c.

Dr. Martin, it may be observed, has continued his researches respecting the action of the mammalian heart, and his paper upon the "Direct Influence of Temperature upon the rate of Beat of the Dog's Heart," which was presented to the Royal Society of London, has had the honor of being selected by that body as "the Croonian Lecture" for the current year.

In addition to the usual courses by Professor Martin and his associates, twenty-seven special lectures were given as follows:

Six lectures by Professor Martin on "Animal Heat and the Physiology of Fever."

Six lectures by Dr. W. K. Brooks on "Heredity."

Two lectures by Dr. W. T. Councilman on "Splenic Fever, as illustrating the relationship of bacterial organisms to the production of infectious disease."

Three lectures by Dr. W. T. Sedgwick on "The Physiology of Reflex Actions"; and one lecture on "The Physiological action of Quinine."

Two lectures by Mr. H. H. Donaldson on "The Influence of Digitaline upon the Circulatory Organs."

Two lectures by Mr. W. H. Howell on "The Influence of the Respiratory Movements upon the Circulation of the Blood."

Two lectures by Mr. H. N. Stokes on "The Physiological Relationships of Urea."

Three lectures by Professor A. H. Tuttle, of Columbus, Ohio, on "The Selection and Use of Microscope Objectives of High Aperture."

Most of the advanced work, however, was carried on individually, and not in classes; each student taking up some special topic for study under the immediate direction of some one of the instructors. In addition to the original researches already enumerated, certain graduate students have in this manner carried on advanced study in various directions. Students engaged in this kind of work, (which forms a stepping-stone between class-work and original research), are usually given some important original article, and shown how to repeat and verify for themselves (and criticise, if necessary) the experiments and results described in it. By studying and repeating the original

work of others they learn the methods of biological investigation, and are thus trained to plan and carry out researches themselves. In connection with this, students are also taught how to hunt up and utilize the bibliography of a subject.

Courses of lectures for undergraduates were given as follows:—

Osteology, twice weekly, from the beginning of November until the end of March.

Mammalian Anatomy, twice weekly, until April.

Animal Physiology and Histology, four times weekly, through the year.

General Biology, three times weekly, until the middle of April.

Embryology of the Chick, four times weekly, from the middle of April until the close of the session.

Plant Analysis, twice weekly during April and May.

In connection with the regular class instruction first year students practically studied a number of typical fungi, green plants, and animals; the skeletons of about twenty selected vertebrates; and the development of the chick in the egg. In the spring, there were given a few practical lessons in the elements of Systematic and Descriptive Botany.

Second year students worked at the histology of the tissues and organs of the higher vertebrata (especially man); the physiological properties and functions of the tissues and organs; the physiology of digestion; the chemistry of bile, urine, etc. The stock of physiological apparatus belonging to the University being unusually large, and including several duplicates of all the more frequently used instruments, each student in the class of Animal Physiology had the opportunity and was required to perform for himself all the really fundamental physiological experiments, save such as required some special skill or the use of very delicate apparatus; these were demonstrated to the class. The cat was also thoroughly dissected by the second year students.

Practical Physiology is so frequently regarded as meaning nothing more than Histology and some Chemical Physiology, that it may be advisable to give examples of the additional experiments which students were required to perform, and of the phenomena demonstrated to them. Each student set up for himself the necessary apparatus, and studied the contraction of a muscle, simple and tetanic; the analysis of tetanus; the action of different stimuli on muscle; the general stimuli of nerves; the reflex actions of the frog's spinal cord; the beat of the frog's heart; the influence of pneumogastric stimulation upon the heart-beat; the absorp-

tion spectra of hæmoglobin and of its chief compounds; the phenomena of accommodation; Scheiner's experiment; Purkinje's figures; the comparative insensibility of the peripheral parts of the retina, etc.

Among the things demonstrated were the electrical currents of muscle and nerve; the action current; the duration of the period of latent excitation; the rate of transmission of a nervous impulse; the beat of the mammalian heart; arterial pressure; the action of the vaso-motor nerves; the secretion of glands upon stimulation of their nerves; the respiratory and vaso-motor centres; the function of the phrenic nerve; the phenomena observed in frogs, birds, and mammals after removal of various parts of the brain; the results of section of the semicircular canals; etc.

ANCIENT AND MODERN LANGUAGES.

Under the direction of Professor Gildersleeve, the advanced students of Greek have been organized into a Greek Seminary. According to the plan of the seminary the work of each year is concentrated on some leading author or some leading department of literature.

Since the Autumn of 1882 the Greek library has found a lodgment in the same building with the seminary room, and the seminary room itself has been furnished with the books bearing on the work immediately in hand. These rooms are much used by the advanced workers in Greek, and the approach to the laboratory ideal has been marked. It is now possible to bring much more material together for the illustration of the seminary exercises, and the familiarity with the standard works is greatly increased. While the grammatical and critical work of the advanced students is lightened by facility of reference to the authorities,

their appreciation of the historical and artistic side of their studies is evidently quickened by the new arrangement, and there is great promise of a keener and deeper interest in Greek life and art.

In 1882-83, the centre of work was Aristophanes. In the seminary proper, which met twice a week during the academic year, the *Wasps* and the *Frogs* were interpreted by the members in turn, and all the plays except the *Lysistrata* were analyzed and introductory lectures prepared by different members of the seminary. Studies were made in Aristophanic syntax and papers were read not only on syntactical topics but on the first and second *Plutos*, on proverbs in Aristophanes, on Aristophanes' theory of comic art, on the character of Kleon, on the proportion of chorus and dialogue in Aristophanes, on Philonides and *Kallistratos*. Work begun the preceding year was carried on, notably an elaborate study of the predicative participle in Attic prose, of which an abstract is given in *Circular No. 22*. In connection with the work of the seminary, Professor Gildersleeve, during the latter part of the academic year, conducted weekly readings in the *Fragments of the Old Attic Comedy* and delivered twelve lectures on Greek metres with especial reference to Aristophanes.

Besides the seminary course proper, Professor Gildersleeve delivered thirty-two lectures on the Hypotactic Sentence, interpreted select odes of Pindar, conducted twenty-two exercises in translating at dictation from Greek into English and English into Greek, and held a series of six conferences with undergraduate students, in which the leading principles of Greek literary art were set forth, with illustrations drawn from the courses pursued in the undergraduate department.

A course in the comparative study of Greek inflections was conducted by Dr. Bloomfield.

This was initiated by a course of seven formal lectures, whose aim it was to exhibit the precise degree of certainty which attached itself to the most important theory of Indo-European language-history, namely, the

theory of agglutination. It was shown that there are grave difficulties in its way, but that on the whole it afforded as yet the only satisfactory explanation propounded for the phenomena of our languages in historical times. The rest of the course was carried on under seminary organization; the origin and form of the verbal inflectional elements being the subject which received most attention. Throughout the year this work was supplemented by the lectures of the instructor.

Mr. Harris has conducted a class-course in New Testament Greek, twice weekly, through the year, and has given two public courses, one, of six lectures, on the Greek of the New Testament, and the other, of five lectures, on the Epistle to Diognetus.

Instruction was given during the year by Professor C. D. Morris, in:—

Plato: *Phaedo*, four times weekly, first half-year.

Aeschylus: *Prometheus*; Euripides: *Medea*, four times weekly, second half-year.

and by Dr. Spieker, in:—

Xenophon: *Cyropædia*, four times weekly, first half-year.

Homer: *Iliad*, XVI-XIX, four times weekly, second half-year.

Classes in Greek Prose Composition were also conducted by each of the instructors in connection with the courses above named.

Students have privately read for examination the following books:

Xenophon: *Convivium* (8); Herodotus: *Selections* (8); Demosthenes: *In Leptinem* (8); Isocrates: *Panegyricus* (2); Plutarch: *Themistocles* (2); Aristophanes: *Plutus* (2); Sophocles: *Electra* (2).

The instruction in Latin under Dr. Warren was carried on with increased facilities. In a room specially set apart for the Latin Seminary, a library of books selected to meet the wants of advanced students was placed, accessible to members of the seminary at all hours of the day. The

plan has been found to have great advantages. Students thus not only become acquainted with the special works bearing upon the particular authors which form the subject of interpretation, but they have their attention called to a great variety of works which are the necessary auxiliaries to the prosecution of classical studies in a broad way. Above all they have the opportunity to gain some familiarity with the new editions of authors and the special treatises, which are constantly appearing; and from seeing the activity of others they are inspired to do original work themselves.

During the past year Cicero was the author selected for special study, one hour weekly being devoted to the Orations and one to the Letters. A preliminary course of lectures was given by Dr. Warren on Cicero, with special reference to his oratorical and literary career. Attention was called to some recent dissertations, which attempt to show certain marked differences of style between the earlier and later orations, and the lines, which an investigation into such differences must follow, were pointed out. The general characteristics of the epistolary style were discussed, and some account given of the theories held in regard to the several collections of Cicero's Letters. Subjects for research, as yet imperfectly explored and likely to yield valuable results to the careful observer, were indicated. The orations were taken up in chronological order, more particular attention being paid to the *Pro Publico Quintio*, *Pro Roscio Comoedo*, in *Caecilium Divinatio*, in *Verrem Actio Prima*, *pro Milone*, and *Philippica II*. The commentary of Asconius to the *pro Milone* was carefully examined, and a large portion of the *pro Roscio Amerino* was made the subject of critical interpretation. In the early part of the year a number of the more difficult letters of Cicero were closely studied. Later on the attention was chiefly turned to the letters of Cicero's correspondents, and papers were presented by different members of the seminary embodying the results of detailed investigations into the peculiarities of the letters of Sulpicius, Vatinius, Dolabella, Curius, Caelius, Plancus, and Marcellus. Other papers were read during the year dealing with the characteristics of vulgar Latin and various points connected with Ciceronian syntax. Some of the papers presented evinced extended reading and good powers of observation. It is believed that if nothing more, some

insight into good methods was gained, and the power to apply them, which must be the chief object in all seminary training.

In the latter part of the year, Dr. Warren lectured weekly to advanced and graduate students on Historical Latin Grammar, with special reference to the genesis of forms and to phonetic laws.

Additional courses have been conducted during the year by Dr. Warren, in : —

Cicero de Finibus, *weekly, first half-year.*

Lucretius, *three times weekly, first half-year.*

Livy, *four times weekly, first half-year.*

Plautus; Terence, *four times weekly, second half-year.*

by Professor C. D. Morris, in : —

Tacitus: *Histories, four times weekly, first half-year.*

Crowell's Selections from the Latin Poets, *four times weekly, second half-year.*

and by Dr. Spieker, in : —

Cicero: *Tusculan Disputations, three times weekly, first half-year.*

Horace, *four times weekly, second half-year.*

Classes in Latin Prose Composition were also conducted by each of the instructors in connection with the courses above named.

Students have privately read for examination the following books:

Livy: *Bks. VI, VII (1)*; Tacitus: *Germania, Agricola (1)*; Cæsar: *Civil War (7)*; Cicero: *De Natura Deorum I (6)*; *De Senectute (8)*; Quintilian: *Bk. x. (1)*; Pliny: *Select Letters (1)*; Ovid: *(2)*; Vergil: *Georgics (2)*; Horace: *Epistles I, II, Ars Poetica (1)*; Terence: *Phormio; Hautontim. (5)*; Lucretius: *Bk. v (4)*.

In Sanskrit, one elementary and three advanced courses were conducted by Dr. Bloomfield, who also instructed a beginners' class in Hebrew during the second half-year.

After a course in Whitney's Grammar, the first part of Bopp's Nala was read by the elementary class, which met twice weekly. One of the advanced classes, meeting weekly, read two episodes of the Kathāsaritsāgara.

A second class, meeting twice weekly, followed a course introductory to the Vedas. In the beginning a short course of lectures was given, sketching the position of the Vedas in the history and literature of India. Throughout the rest of the year there were read hymns of the Rig-Veda characteristic of the life, the religion, and customs of the earliest Indian period. Particular attention was given to the relation of the language of the earliest Veda to that of the common or classical Sanskrit.

A course in Comparative Grammar of Sanskrit was carried on in the following manner. The subject chosen for treatment was the representation of the two Indo-European series of gutturals especially in Sanskrit but with constant reference to the nearer relatives of the Indian languages, especially the Zend, and the Greek. The more important investigations on this subject were made the basis of the discussion, but these were constantly supplemented by the lectures of the instructor.

A statement of the course in the comparative study of Greek inflections is made under Greek above.

The class in Hebrew followed a course through Davidson's grammar, and afterward the reading and analysis of the first chapters of Genesis were entered upon.

In German advanced courses were conducted as follows :

Gothic. *Weekly, first half-year, and twice weekly, second half-year.*
DR. WOOD.

Old High German. *Twice weekly.* DR. BRIGHT.

Middle High German. *Twice weekly.* MR. RADDATZ.

History of German Literature, consisting of lectures in German. *On alternate Saturdays.* DR. WOOD.

Deutsche Stilübungen and Essays. *Monthly.* MR. RADDATZ.

Reading of the classical authors. *Four times weekly.* DR. BRIGHT.

Prose Composition. *Weekly.* MR. RADDATZ.

German Syntax. *Three times monthly.* MR. RADDATZ.

Other classes were instructed by Dr. Wood and Dr. Bright four times weekly.

Selections were read from Schiller's, Goethe's, and Humboldt's Prose, Dahn's *Urgeschichte der germanischen und romanischen Völker*, Hodges' *Scientific German* and Goethe's *Egmont*, and one exercise was given weekly in grammar and prose composition.

Students have read privately for examination :

Schiller's *Wallenstein* (1), *Tell* (2), *Neffe als Onkel* (15); Gryphius' *Peter Squeez* (1); Middle High German: Selections from Weinhold's Reader (1).

Dr. Wood has met two advanced classes in Anglo-Saxon and Early English, each twice weekly.

He has read with them Sweet's Anglo-Saxon Reader, part of Cynewulf's *Elene*, and Specimens of Early English, ed. Morris and Skeat, Pt. I. To the same classes he also lectured, once weekly, first half-year, on Comparative Anglo-Saxon Grammar. In the second half-year, a second hour weekly in Gothic (see German courses) was substituted for the weekly hour in Old-Saxon announced.

There was also a fortnightly meeting of the advanced students under the direction of Dr. Wood during the second half-year, at which papers were read, brief reports presented, and the contents of recent scientific journals discussed.

Besides these, the following less advanced classes, including the minor course classes, have been conducted by Dr. Wood.

Anglo-Saxon for beginners. *Weekly.*

Chaucer, *The Prologue*, etc., ed. Morris. *Twice weekly, second half-year.*

Shakspeare, *Macbeth*. *Weekly, first half-year.*

English Phonetics, Sweet's *Hand Book*. *Weekly, first half-year.*

Dr. Browne has met, twice weekly, a class for reading works by the best English Prose Writers. Selections from Burke, Fitz-James Stephen, and Defoe have been read. Essays have been written monthly by each member of the class, and have been corrected and commented upon by the instructor.

In the Romance Languages advanced courses were conducted by Mr. Elliott as follows :

Old French—The *Passion du Christ* (x century) was taken up and its mixed dialect character particularly studied in its linguistic relations to both the Provençal and *Langue d'oïl* types. *Twice weekly, first half-year.*

Old Franco-Norman Dialect.—The *Vie de Saint Alexis* (xi century) and Wace's *Roman de Rou* (xii century) were examined in their relation to English and to the French proper. *Twice weekly, second half-year.*

Provençal.—Extracts from Bartsch's *Chrestomathie Provençale* confined to the xii century language with practical exercises and special comparison with the Latin and the other Romance idioms, in phonetics and morphology. *Weekly, through the year.*

Romance Dialects.—Lectures and practical exercises in the Italian and Provençal dialects. *Weekly, through the year.*

Portuguese.—Os *Lusiadas* de Camões was read with special reference to the language of this period as compared with the Spanish and Latin. *Weekly, through the year.*

Italian.—Dante. *Twice weekly, first half-year.*

Spanish.—Don Quijote. *Twice weekly, second half-year.*

Mr. Marcou gave lessons in:—

Old French. *Twice weekly, through the year.*

French Literature. *Weekly, through the year.*

He also conducted the Minor Course classes in French, which met seven times weekly.

The reading embraced Fustel de Coulanges, *La Cité Antique*; Elisée Reclus; Molière; Victor Hugo; etc., and there was one exercise weekly in grammar and prose composition.

M. Rabillon's exercises were these:—

Two public courses on French Literature, including twenty-two lectures (in French).

Classes in French conversation and composition and in the rudiments of French.

Professor Paul Haupt, of the University of Göttingen, having accepted a call to this university, is expected to begin his instructions at the beginning of the new academic year. His department includes the group of Shemitic Languages,—Hebrew, Arabic, Ethiopic and Assyrian.

HISTORY AND POLITICAL SCIENCE.

The instruction in History and Political Science has been under the direction of Dr. H. B. Adams, with the coöperation of Dr. R. T. Ely, in Political Science, and of Dr. J. F. Jameson in Ancient History. A decided impulse was given to these studies by an important accession of books received by the university early in the academic year. The library of Professor Bluntschli, of Heidelberg, the renowned teacher and writer, having been offered for sale, was bought by a number of the German citizens of Baltimore, and formally presented to the Trustees of this institution December 20, 1882. A particular statement of the character of this most welcome gift may be found elsewhere.* These books were temporarily placed in a room on Monument street, where a company of graduate students assembled every Friday evening, during the year, for a two hour session. Their studies at this time were chiefly directed to American Institutional and American Economic History, and a number of papers, the results of this work, have already been published.

The instruction given by Dr. Adams during the year was as follows :

1. Class-lectures on the Sources of Early English History were given weekly during the first half-year, and on Comparative Constitutional History (with Bluntschli's "*Lehre vom Modernen Stat*" as basis),

* Johns Hopkins University Circulars, No. 21, February, 1883.

during the second half-year. These lectures were given in the small lecture-room at the Peabody Institute, where, through the courtesy of the authorities in charge, the privilege has been enjoyed of exhibiting to the class all available books and sources of information mentioned in the lectures. These literary materials were briefly described and then referred to individuals for more detailed examination at the Institute during the week, each man taking some one theme or original authority. Such study led to a course of student lectures, the second half-year, upon special topics connected with the class-work.

2. A Minor Course in Modern History, for students of at least one year's standing, five hours weekly throughout the year. The first part of this course consisted of lectures, essays, and examinations on the Italian Renaissance, with Sismondi's History of the Italian Republics for a class-book, and with a class-library consisting of Symonds, Burckhardt, Villari, Milman, Hallam, etc., for topical reading and reference. The second part of the course was devoted to a study of the Reformation in Germany, Switzerland, France, and England, together with the Revolt of the Netherlands and the Thirty Years' War, with frequent oral and written examinations.

3. An Introductory Course of twelve lectures on Oriental History.

Four public lectures were given by Dr. Adams before the Peabody Institute on Local Life and Home Institutions.

The instruction by Dr. Ely was as follows :

1. Class-lectures on Finance and Administration, three hours weekly throughout the year. Particular attention has been devoted to the General Principles of Banking, and Banking in the United States, to monometallism and bimetalism, and to taxation. Each member of the class has written a description of the National Banking System, basing his essay on the banking laws, government documents and such other material as he could command. Papers on monometallism and bimetalism were read before the class by students, and were followed by a discussion. Papers have been written by students on different topics connected with the Financial History of the United States, such as the First and Second United States Banks, the Income Tax, National Finances from 1861-5, etc. Beginnings of a series of papers on finance in state and city have been made and will be continued during the coming academic year. Apart from financial administration, attention has been given to the Civil Service in this and other countries, and to municipal government.

2. Six public lectures, since printed in a volume, upon the History of French and German Socialism.

3. A Minor Course in Political Economy, five hours weekly throughout the year. The first part of this course consisted of an exposition of the Principles of Political Economy, with the work of John Stuart Mill as a basis. The second part was a further development of this subject, together with lectures upon Historical Systems of Political Economy.

Dr. Jameson gave class instruction to undergraduates twice a week through the year, in the History of Greece and Rome, and in the History of Early Europe.

PHILOSOPHY.

The instruction in Philosophical subjects still remains in charge of three lecturers. Professor Morris, of the University of Michigan, continues to spend the first half of the year among us, and in February his place is taken by Dr. G. Stanley Hall. Mr. Peirce's courses in Logic have gone on through the year.

The instruction during 1882-83 included the following subjects :

Prof. G. S. MORRIS, during the first half-year :—

Philosophical Seminary : Science of Knowledge. *Twice weekly.*

History of Philosophy in Great Britain. *Three times weekly.*

Philosophy of History, (Hegel). *Weekly.*

Ethics and History of Philosophy, (minor course). *Daily.*

Lectures on Ethics, (introductory course). *Weekly.*

Dr. G. S. HALL, during the second half-year :—

Psychology, (advanced course). *Four times weekly.*

Psychology, (elementary course). *Three times weekly.*

Mr. C. S. PEIRCE, through the year :—

Logic. *Four times weekly.*

PHYSICAL CULTURE.





The necessity of providing some means for the promotion of physical culture and of active sports has constantly been considered by the authorities since the opening of the university, but it is only

within the past twelve months that a satisfactory plan has been agreed upon. At the beginning of the year Dr. E. M. Hartwell, one of our own former Fellows, a graduate first in biological and afterwards in medical science was invited to come here as an instructor in physical culture. He delivered a short course of lectures on Health to the undergraduates, last winter, but he gave his chief attention to the subject of a gymnasium and to the promotion of out door sports. Until the grounds at Clifton could be made ready for ball-playing, the temporary hiring of Newington Park was authorized by the Trustees. Finally, they determined to erect a suitable building for bodily training and gymnastic sports, quite near to the university class rooms. After Dr. Hartwell had visited several of the best gymnasiums in the country a plan was adopted, and the contracts were made for the construction of a large gymnasium, which at the date of this report is nearly ready to be occupied. It will be furnished with the Sargent apparatus, such as is used in the Hemenway gymnasium of Harvard College. Suitable rooms for the director, and for bathing and dressing will be provided near the exercise hall.

Great advantages are expected from this addition to our resources, and I cannot refrain from expressing the belief that both the gymnasium and the play-ground will contribute to the health and

pleasure of the students, and secure their development in strength and grace. I hope that the new arrangements will foster companionship in hours of recreation, and encourage agreeable exercise, out of doors in fine weather, in doors during the inclement season; that methods of securing to each individual the training best adapted to his requirements will be steadily provided; and that in all the sport which will come from these opportunities it will be the sport of gentlemen and not of hired performers.

There is danger that "professional" play will gradually cease to be "play" and become a business. It cannot then expect encouragement from the authorities,—for it will no longer contribute to the zest of college comradeship or the maintenance of good health. Men devoted to intellectual pursuits will not long take pleasure in competing with those to whom the exercise of the body is the principal business of life.

The ground plan of the building in which the gymnasium and dressing rooms are contained resembles in shape a letter L turned thus . The main building of the  abutting on Garden street is 104 feet in length, includes the gymnasium proper and a vestibule, and the wing of the  extending from Garden street to the rear of Bentley Hall is nearly 85 feet in length. The entrance to the building is on Garden street at the junction of the main building and the wing of the . The entrance is through a vestibule, out of which, upon the first floor, doors open into the main hall and into the private dressing rooms, while on the second floor, at the head of a flight of steps, is the door of the Director's rooms, in which the physical examinations are made and recorded. The vestibule and gymnasium hall are in the new building; while the dressing and bath rooms, and the offices of the Director are in the wing.

The main hall comprises a single room, open to the roof, and has a total height from floor to ridge pole of 43 feet. It has upwards of 3400 square feet of flooring; its walls, of painted brick, are 25 feet high and 18 inches thick; and each of its side walls contains seven high and wide windows whose sills are seven feet from the floor.

GRADUATES OF THE YEAR.

The number of undergraduates who have come forward to the baccalaureate degree, during the year, is ten, making the whole number of bachelors of arts, here created in five years, fifty-six. The names of those graduating in 1882-83 are as follows:

BACHELORS OF ARTS.

William S. Bayley, Baltimore.	Gonzalez Lodge, Baltimore.
Maurice Fels, Philadelphia.	William E. Stratton, Baltimore.
D. Sterrett Gittings, Baltimore.	Henry W. Williams, Baltimore.
W. Beatty Harlan, Churchville.	Henry V. Wilson, Baltimore.
George T. Kemp, Baltimore.	Wm. J. Witzenbacher, Hagerstown.

Six candidates, who had presented the requisite theses and had also passed the examinations successfully, were made doctors of philosophy. The whole number of persons admitted among us to this second degree is thirty-nine.

The names of the doctors of philosophy (1882-83) and the titles of their theses are as follows:

DOCTORS OF PHILOSOPHY.

William J. Alexander, of Hamilton, Ontario, A. B., University of London, 1876. His principal subject was Greek, the subsidiary, Latin. He submitted a thesis on "Participial Periphrases in Attic Prose," which has been published in the American Journal of Philology.

William C. Day, of Baltimore, A. B., Johns Hopkins University, 1880. His principal subject was Chemistry, the subordinate, Physics. He submitted a thesis on "The Oxidation of β -Cymenesulphamide," which has appeared, in modified form, in the American Chemical Journal.

William P. Durfee, of Berkeley, California, A. B., University of Michigan, 1876. His principal subject was Mathematics, his subordinate, Physics. He submitted a thesis on "Symmetric Functions," of which portions have already appeared in the *American Journal of Mathematics*.

George S. Ely, of Fredonia, N. Y., A. B., Amherst College, 1878. His principal subject was Mathematics, his subordinate, Physics. He submitted a thesis on "Bernoulli's Numbers," of which portions have already appeared in the *American Journal of Mathematics*.

Kakichi Mitsukuri, of Tokio, Japan, Ph. B., Yale College, 1879, who here pursued studies in Biology, and has since been called to the Professorship of Zoölogy in the University of Tokio, Japan. His thesis on "The Structure and Significance of some Aberrant Forms of Lamelli-branchiate Gills," has been published in the *Monthly Journal of Microscopical Science*.

Bernard F. O'Connor, of Baltimore, Bach. ès Lettres, Université de France, 1874. His principal study was the Romance Languages, the subordinate, Latin. His thesis on "The Syntax of Ville-Hardouin" was submitted to Professor J. A. Harrison, of Washington and Lee University.

RECENT DISCUSSION OF COLLEGIATE INSTRUCTION.

During the past year, it has been thought desirable to consider in a careful way the subject of college education by itself and in its relations to university work. A Board of collegiate instructors was accordingly organized in June, 1882, consisting of nine members, the President of the University, three professors and five associates. Between that date and April 7, 1883, they held a series of twenty meetings, in which they made a careful examination of the methods pursued in kindred institutions, the American college and scientific school, the English collegiate system, the German gymnasium and realschule, and other foundations for the training of young men.

In constituting this board, one representative was taken from each of eight departments of

study, (four called "literary," and four called "scientific,") namely, Greek, Latin, Modern Languages, and History: Mathematics, Chemistry, Physics, and Biology. It happened also that among this number were graduates of a great variety of institutions,—University of Oxford, University of Cambridge, University of London, University of Heidelberg, University of Leipsic, University of Göttingen, University of Strassburg, Harvard College, Yale College, Amherst College, Haverford College, Sheffield Scientific School, College of Physicians and Surgeons (N. Y).

Looking therefore at the present pursuits of the members of the Board, and at their previous training, it is obvious that they are familiar in their personal experience with widely different methods of education and with various requirements of intellectual life. It would be presumptuous to suppose that their decisions are final. Doubtless year by year improvements will be made in the plans upon which they have agreed. Doubtless, with all the study now given to higher education and to the science of pedagogics, the colleges of the future will be better than the colleges of the past. Nevertheless, the unanimous conclusions of such a body of men, approved subsequently by two other supervisory bodies in the University, may be regarded as marking a positive station in the advancement of our educational plans. The diffi-

culties encountered in this discussion will never be entirely overcome. They involve the old question of reconciling freedom and obligation, or, in other words, of liberty and law. It is clear that some choice must be allowed to every student, and indeed required of him. No one, however good his talents, can pursue advantageously all the inviting subjects which are presented to his intellectual appetite. He must select. On the other hand, if a youth of collegiate age is left to choose without guidance, the infirmities of human nature are such that he is likely to blunder, or to choose the easy work instead of that which will be the most fruitful, or oftener still, to take a little of this and a little of that in inadequate quantities which may satiate the appetite, while they yield no suitable nutrition. The Board at length agreed to arrange seven courses of study, each of which is believed to be good for a certain class of minds; each of which contains indispensable studies; each of which combines mathematics and physical science, with literature, philosophy, and history.

In determining what course to follow, the student is to have, hereafter as heretofore, the counsel of a member of the Board, as his Adviser, and he is not to change from one course to another, without very special reasons approved by the entire Board. All the courses lead to the same degree,

that of Bachelor of Arts, which can usually be gained three years after the matriculation is completed. The matriculation is believed to be as difficult to pass, as the examinations usually required for admission to a Sophomore class. Good students are allowed to remain with us one year, before completing matriculation, and thus the time devoted to the college courses corresponds with that which is usual in American colleges. Some go on more rapidly; some more slowly. It is our desire to receive scholars about the age of sixteen, and to graduate them about twenty years of age; so that one, two, or three years of non-professional university studies may be pursued among us, or elsewhere, by the recent graduates, looking forward in many cases to the second degree of Master of Arts and Doctor of Philosophy. An extended statement of the conclusions of the Board, here briefly stated, may be found in the Annual Register for 1882-83, published in June last, to which is appended a special paper "on the opportunities here afforded for collegiate training." While the discussion was in progress much encouragement was received from one of the most cultivated members of the bar in Baltimore, Hon. S. T. Wallis, who delivered a public address on Collegiate Education in its local aspects,—since printed, (as elsewhere stated), and widely read.

CHESAPEAKE ZOÖLOGICAL LABORATORY.

I shall say but little of the Chesapeake Zoölogical Laboratory in this place (although its work has been of great value), because the Director, Dr. Brooks, has prepared at my request, a careful review of all that has been done by this branch of the university since it was established in 1878. His careful report is given on a subsequent page. The laboratory has been stationed in three seasons on the Chesapeake, in three seasons at Beaufort, N. C. Forty well trained investigators have been connected with it, and their researches have contributed more or less toward the publication of fifty-five papers, of which a printed list is given. Dr. Brooks' study of the oyster question deserves the special recognition of all the citizens of Maryland who are interested in this important subject. For the scientific work which he did in this connection he received a medal from the *Société d'acclimatation*, of Paris, in 1882. Within the past year, one of his co-workers, Mr. H. W. Conn, has been honored with a Walker prize given by the Boston Society of Natural History for his paper on *Thallassima*.

LIBRARY.

Our library has now reached a considerable size, but its value depends not so much upon the number of volumes, as upon their character.

Some books were bought, at the beginning, on general principles, as of importance to all members of the university. This selection included various indispensable dictionaries and encyclopædic works, several series of periodicals, and a selection of important texts, grammars, histories, and books of acknowledged literary value. This nucleus was soon surrounded by special collections brought together under the general superintendence of the library at the request of the principal teachers. The result has been a choice collection of modern books, if not large, yet well adapted to our needs and constantly augmented. As the space originally appropriated is now filled, it has been found convenient to detach certain portions of the library for use in other rooms,—a plan which has disadvantages as well as merits. On the one hand, it is convenient to the instructor to have within easy reach of his class-room a collection of books; on the other hand, the library, as a whole, sometimes seems to lose by this arrangement a part of its attractions. At present, as far as I can judge, the tendency to remove books from the central room has gone quite far enough, and we should all look forward to the time when more ample space will be appropriated for the general library, and when more ample funds will be allowed for the purchase of duplicate copies of such books as may be

specially needed both in the central room and in the several laboratories and seminaries. Another solution of the difficulty will be for us to turn more and more to the Peabody Institute, the general library designed by its founder for the use of scholars in Baltimore, and to maintain in the university only the special apparatus which the various departments require.

It may be worth while to recall in this connection the words of a well-known writer on the value of libraries in university education. Carlyle, in a passage of his "*Heroes and Hero Worship*," says :

. . . "the University which would completely take in that great new fact, of the existence of Printed Books, and stand on a clear footing for the Nineteenth Century as the Paris one did for the Thirteenth, has not yet come into existence. If we think of it, all that a University, or final highest School can do for us, is still but what the first School began doing.—teach us to read. We learn to read, in various languages, in various sciences; we learn the alphabet and letters of all manner of Books. But the place where we are to get knowledge, even theoretic knowledge, is the Books themselves! It depends on what we read, after all manners of Professors have done their best for us. The true University of these days is a Collection of Books."

Within the year, besides many smaller gifts, the University has received as a present from some of the German residents of Baltimore, the library of Dr. Bluntschli, long honored as a Professor of Public Law in the university of Heidelberg. The collection is very valuable from many points of view; first as a token of good will from some of our friends and neighbors who took this mode of showing their appreciation of our work; next as

a memorial of an illustrious man, whose writings have tended to establish the true idea of a modern state, and of a successful teacher, two of whose followers are enrolled on our staff. But besides this, the collection of books is quite comprehensive, being particularly rich in treatises on political science now difficult to find. The reception of this library was made the occasion for a social assembly in which the donors and the members of the university took part. A full account of the library and of the presentation may be found in the Johns Hopkins University Circulars for February, 1883.

The Librarian's acknowledgment of other gifts will be found in the appendix. The number of bound volumes belonging to the University, September 1, 1883, was 18,700; the number of periodicals received was 382. Besides the serials to which the University subscribes, a large number are taken in the Library of the Peabody Institute and in other libraries of the city.

By the courtesy of librarians at a distance we continue to be favored occasionally with the loan of books not accessible to us in Baltimore. Thanks are especially due to the Librarian of the Surgeon General's Office, U. S. A., and to Yale College.

The arrangement for calling attention to recent publications, which is known among us as the New Book Department, is of the highest value.

COLLECTION OF MINERALS.

The University continues to be indebted to George T. Marye, Esq., of San Francisco, for his kindness in sending to us, from time to time, valuable specimens of the mineral resources of the Pacific States. By the liberality of Messrs. Wells, Fargo & Co., of San Francisco, and of the Adams Express Company, through their Baltimore agency, these gifts are transported across the continent without any charge to us. Some purchases of other minerals have been made, and some other gifts have been received. The mineral collection is now in the hands of Dr. G. H. Williams, and under his care will be constantly in use for the instruction of those who study mineralogy.*

UNIVERSITY SOCIETIES.

A considerable part of the activity of the University is manifested in the several associations, composed of members of the faculty and advanced students, which meet regularly for the presentation and discussion of original papers. These societies are:—

1. The Scientific Association, under the presidency of Professor Sylvester, which has held seven meetings. Papers have been read by:—

*Since the date of this report, the Johns Hopkins University has bought at the suggestion of Professor G. J. Brush, the distinguished mineralogist, a very valuable collection brought together by the long continued exertions of Professor O. D. Allen, of the Sheffield Scientific School.

- G. Bissing, note on the Helmholtz-Koenig controversy.
 W. K. Brooks, on alternation of generations in the Hydro-Medusae.
 H. W. Conn, radial and bi-lateral symmetry in animals.
 W. T. Councilman, on the lower organisms in their relation to disease.
 J. R. Duggan, on pleomorphism in *Penicillium*.
 E. M. Hartwell, note on the anatomy of the malar bone; on the relation of bi-lateral symmetry to function.
 C. S. Hastings, on a newly-recognized agent in geological change; on the transit of Venus.
 A. L. Kimball, preliminary notice of a new determination of the value of the Ohm.
 I. Remsen, on white phosphorus; on the action of phosphorus on moist air; on some recent investigations upon what is called the "nascent" state of elements.
 H. A. Rowland, on progress in spectrum photography; note on the distribution of heat in the spectrum of an incandescent solid body.
 W. T. Sedgwick, notes from the biological laboratory.
 J. J. Sylvester, on the graphical proof of certain algebraical problems.
 A. H. Tuttle, on cilia in the human kidney.
 G. H. Williams, review of the results obtained by Fouqué and Michel Lévy, of Paris, in the synthesis of rocks.

2. The Philological Association, under the presidency of Professor Gildersleeve, which has had seven meetings. Papers have been read by:—

- W. J. Alexander, on Matthew Arnold's poetry test; participial periphrases in Attic prose.
 M. Bloomfield, on a search for functional and dialectic differences in the present systems of the Veda; Arthur C. Burnell and the Talavakāra Brāhmaṇa; the general theory of Greek accentuation; the etymology of *φίλος*.
 J. W. Bright, on a fragment of the *Cura Pastoralis*.
 A. M. Elliott, on functional differences of the past participle in the periphrastic perfects of the Latin, old and modern French.
 A. Emerson, on the so-called dying Alexander of the Uffizi Gallery.
 B. L. Gildersleeve, on aesthetic and grammar; on the symmetrical structure of the Pindaric odes.
 J. R. Harris, on the locality of the treatise of Palladius *De Agricultura*; "New Testament autographs"; the normal forms of the Pliny and Cicero letters; notes on the stichometry of Euthalius.

- H. C. G. v. Jagemann, on the second mutation of consonants in French; some points in the relations of the Norman dialects to English pronunciation.
- P. B. Marcou, on French syntax as affected by the cultivation of style.
- C. D. Morris, on a probable error in Plutarch; a note on the Chalcidians; on the Athenian jurisdiction over the allies.
- B. F. O'Connor, review of Professor Harrison's "French Syntax."
- E. H. Spieker, on the use of $\delta\tau\epsilon$ (or $\delta\epsilon$) in direct quotations.
- A. H. Tolman, on quantity in English verse and the use of the hexameter; the laws of tone-color in the English language.
- M. Warren, on the importance of Latin glossaries with special reference to Codex Sangallensis, 912, Saec. VII-VIII; on a Plautine pun.

3. The Mathematical Society, under the presidency of Professor Sylvester, which has had seven meetings. Papers have been read by:—

- E. Barnes, note on the strophoids.
- E. W. Davis, on the maximum value of a certain determinant; note on binodal quartics.
- W. P. Durfee, on the tabulation of symmetric functions.
- G. S. Ely, on a geometric locus; on the numbers $a_{m,n}$ which occur in connection with the proof of Staudt's theorem concerning Bernoulli's numbers; on the divisions of Euler's numbers.
- F. Franklin, on Crocchi's theorem; on the expression for the volume of a tetrahedron in terms of its edges; on partitions; on the value of Euler's constant.
- A. S. Hathaway, on the equation of a curve referred to a maximum inscribed triangle; a proof of a theorem of Jacobi, by correspondence.
- O. H. Mitchell, note on conic sections.
- C. S. Peirce, on a class of multiple algebras.
- W. E. Story, on measurement in non-Euclidean geometry; on the non-Euclidean theory of conics; a remark on Farey series; on the number of intersections of curves drawn on quadrics; on the number of intersections of curves drawn on a given ruled surface.
- J. J. Sylvester, on certain successions of integers that cannot be indefinitely continued; on Crocchi's theorem; on a fundamental theorem in the new method of partitions; proof of a well-known development of a continued product in a series; on the number of fractions in their lowest terms whose numerators and denominators are limited not to exceed a certain number; on a general theorem in partitions; on a theorem in the *Fundamenta Nova*; on Farey series.

4. The Historical and Political Science Association, under the direction of Dr. H. B. Adams, which has held frequent meetings. Among the papers read were the following:—

- H. B. Adams, the English parish in America; Plymouth Rock restored.
- W. Allan, the Peninsula campaign of 1862.
- C. M. Armstrong, taxation in Maryland.
- E. W. Bemis, local government in the Northwest.
- H. W. Caldwell, the income tax in the United States.
- W. T. Crossdale, town and gown.
- A. B. Davis, local government in Montgomery county.
- R. T. Ely, money and its functions; political economy in Germany in 1882; the past and present of political economy.
- F. J. Goodnow, the office of public prosecutor.
- J. F. Jameson, account of the contents of the Bluntschli library.
- J. Johnson, customs of land tenure among the boys of the McDonogh Institute; old Maryland manors.
- J. H. B. Latrobe, recollections of Madison and other statesmen.
- B. J. Ramage, the Baltimore & Ohio employes relief association; the district system of South Carolina; from a Connecticut town to a South Carolina parish.
- J. C. Rose, municipal politics in Baltimore.
- O. H. Shinn, the migration problem; the Spanish plots in the Southwest; the university of Oxford and the Oxford humanists.
- L. W. Wilhelm, the national banking system of the United States; the township in Maryland.
- T. Williams, the revised tariff in its relation to the economic history of the United States.
- A. Yager, an essay on the financial history of the United States during the civil war.

5. The Metaphysical Club, under the guidance of Messrs. G. Stanley Hall, G. S. Morris and C. S. Peirce, which has held seven meetings. Communications were presented as follows:—

- J. M. Cattell, on the recent philosophical journals.
- J. Dewey, knowledge and the relativity of feeling; Hegel and the theory of categories.

- B. L. Gildersleeve, rhythm in the classic languages.
G. S. Hall, a study of reaction, time, and attention in the hypnotic state.
J. Jastrow, the logical problem; a note on mechanical logic.
H. N. Martin, on the development of sight in the lower organisms.
C. T. McDaniel, on Samuel Tyler, a member of the Baltimore Bar, who wrote on philosophical subjects.
G. S. Morris, university and philosophy; on the philosophical work of Henry James, Sr.
I. Remsen, on Wundt's Logic of Chemistry.
W. T. Sedgwick, concerning perception and reflex action in the frog.
A. H. Tolman, a review of Dr. Hopkins's "Outline Study of Man."

6. The Naturalists' Field Club, under the presidency of Dr. Sedgwick.

This was organized by members of the university, but includes in its list of members other residents of Baltimore, interested in Natural History. The club works in three sections—Geology and Mineralogy, Zoology, and Botany. Each section selects its own officers and arranges for its own field excursions and its own meetings. There are also monthly meetings of the whole club, at which the chairmen of the different sections report progress, and an address on some topic of Natural History is given by one of the members. During the last winter special public addresses were given by Professor H. N. Martin, on The Life and Work of Charles Darwin; by Mr. P. R. Uhler, on The Geology of the Surface Features of the Baltimore Area; by Dr. B. W. Barton, on The Dispersion of Seeds and the Migration of Plants; by Mr. H. H. Donaldson, on A Trip to Labrador and Newfoundland; by Dr. W. T. Sedgwick, on The Migration of Birds.

PUBLIC LECTURES.

During the year the following courses of lectures, open to the public, were given in Hopkins Hall:—

1. On the Greek of the New Testament and the Early Fathers, by Mr. J. Rendel Harris, six lectures, with an average attendance of 73.
2. On the Eddas and other Old Norse Literature, by Dr. William H. Carpenter, Fellow by Courtesy, twelve lectures, with an average attendance of 122.
3. On the Epistle to Diognetus, by Mr. J. Rendel Harris, five lectures, with an average attendance of 58.
4. On French and German Socialism, by Dr. R. T. Ely, six lectures, with an average attendance of 117.

5. On Etchers and Etching, by F. Seymour Haden, F. R. C. S., England, three lectures, with an average attendance of 222.

6. On Michel Angelo, by W. W. Story, Esq., of Rome, one lecture, with an attendance of 260.

7. On Philosophy and Christianity, by Professor George S. Morris, eight lectures, with an average attendance of 187.

8. On Poetry, as an Embodiment of the Spiritual and an Interpretation of Life, by Professor Hiram Corson, of Cornell University, ten lectures, with an average attendance of 202.

9. On Anglo-Saxon Poetry, by Professor James A. Harrison, of Washington and Lee University, ten lectures, with an average attendance of 100.

10. On the Principles and Methods of Intellectual Training, by Dr. G. Stanley Hall, eight lectures, with an average attendance of 191.

11. On the Relations of Literature to Modern Society, by Mr. George W. Cable, of New Orleans, six lectures and one reading, with an average attendance of 225.

12. On the Early French Chroniclers of the Crusades, by Dr. Bernard F. O'Connor, Fellow by Courtesy, six lectures, with an average attendance of 68.

13. On French Literature, by M. Rabillon, two courses (in the French language), including twenty-two lectures, with an average attendance of 37.

These thirteen courses included one hundred and four lectures. The average attendance upon the lectures (not including those given in the French language) was one hundred and forty-eight.

PUBLICATIONS.

Three numbers of the fifth and the first number of the sixth volume of the *American Journal of Mathematics* have been issued during the academic year. A Memoir on the Abelian and Theta Functions, by Professor Cayley, containing the substance of his lectures given before this university in the previous year, has appeared in the *Journal*. Papers by members of the University have been contributed as follows:—

- Some elliptic function formulæ, by T. Craig.
 Note on the counter-pedal surface of an ellipsoid, by T. Craig.
 On a theta-function formula, by T. Craig.
 On quadruple theta-functions, by T. Craig.
 An expression of the co-ordinates of a point on a bi-nodal quartic curve as rational functions of the elliptic functions of a variable parameter, by E. W. Davis.
 Tables of the symmetric functions of the twelfthic, by W. P. Durfee.
 The tabulation of symmetric functions, by W. P. Durfee.
 Bibliography of Bernouilli's numbers, by G. S. Ely.
 Some notes on the numbers of Bernouilli and Euler, by G. S. Ely.
 On cubic curves, by F. Franklin.
 On the non-Euclidean geometry, by W. E. Story.
 On non-Euclidean properties of conics, by W. E. Story.
 On subinvariants, *i. e.* semi-invariants to binary quantics of an unlimited order, by J. J. Sylvester.
 Tables of generating functions, reduced and representative for certain ternary systems of binary forms, by J. J. Sylvester.
 A constructive theory of partitions, arranged in three acts, an inter-act in two parts, and an exodion, by J. J. Sylvester.

Six numbers of the American Chemical Journal have appeared within the year, bringing the series down to the third number of the fifth volume. They have contained papers by members of the University as follows:—

- On ethoxy-metatoluic acid, by P. H. Broun.
 Estimation of sulphur in organic compounds, by E. H. Keiser.
 On the oxidation of benzene derivatives with potassium ferricyanide, by W. A. Noyes.
 Experiments with derivatives of naphthalene, by I. Remsen and W. J. Comstock.
 Oxidation of β -cymenesulphamide, by I. Remsen and W. C. Day.
 Oxidation of para-dipropyl-benzene-sulphamide, by I. Remsen and E. H. Keiser.
 On the conduct of moist phosphorus and air towards carbon monoxide, by I. Remsen and E. H. Keiser.
 On white phosphorus, by I. Remsen and E. H. Keiser.

The third volume of the American Journal of Philology has been completed during the year, and

two numbers of the fourth volume have also been issued. A supplementary number of this Journal, containing a paper (with four plates) by Mr. Harris, on New Testament Autographs, has been published. Papers by members of the University have appeared as follows:—

Historical and critical remarks introductory to a comparative study of Greek syntax, by M. Bloomfield.

The dying Alexander of the Uffizi gallery, etc., by A. Emerson.

Studies in Pindaric syntax, by B. L. Gildersleeve.

On New Testament autographs, by J. Rendel Harris.

On stichometry. I, by J. Rendel Harris.

On the locality to which the treatise of Palladius *De Agricultura* must be assigned, by J. Rendel Harris.

On a probable error in Plutarch, Per. C. 23, by C. D. Morris.

On Bentley's English MSS. of Terence, by M. Warren.

Part IV completing the second volume of Studies from the Biological Laboratory was issued in July. Its contents are exclusively by workers among us, viz:

Notes on the development of *Panopæus Sayi*, by E. A. Birge.

The structure and growth of the shell of the oyster, by Henry L. Osborn.

The nervous system of *Porpita*, by H. W. Conn and H. G. Beyer.

On the presence of ciliated epithelium in the human kidney, by A. H. Tuttle.

The action of ethyl alcohol upon the dog's heart, by H. Newell Martin and Lewis T. Stevens.

On the effect of variations of arterial pressure on the duration of the systole and diastole of the heart-beat, by W. H. Howell and J. S. Ely.

Notes on the Medusæ of Beaufort, N. C., part II, by W. K. Brooks.

The direct influence of gradual variations of temperature upon the rate of beat of the dog's heart, by H. Newell Martin.

A series of monographs, edited by Dr. H. B. Adams, entitled "Studies in Historical and Political Science," was commenced within the year.

The papers below named, constituting one volume, have already been printed with an extended index.

An introduction to American institutional history, by E. A. Freeman.
The Germanic origin of New England towns, by H. B. Adams.
Local government in Illinois, by Albert Shaw.
Local government in Pennsylvania, by E. R. L. Gould.
Saxon tithingmen in America, by H. B. Adams.
Local government in Michigan and the Northwest, by E. W. Bemis.
Parish institutions of Maryland, by Edward Ingle.
Old Maryland manors, by John Johnson.
Norman constables in America, by H. B. Adams.
Village communities of Cape Anne and Salem, by H. B. Adams.
The genesis of a New England State (Connecticut), by A. Johnston.
Local government and free schools in South Carolina, by B. J. Ramage.

A volume of Contributions to Logic by members of a class, which followed the instructions of Mr. C. S. Peirce, has been issued under his editorial care by the firm of Little, Brown & Co. It contains:—

The logic of the Epicureans, by Allan Marquand.
A machine for producing syllogistic variations, by Allan Marquand.
On the algebra of logic, by Christine Ladd.
On a new algebra of logic, by O. H. Mitchell.
Operations in relative number with applications to the theory of probabilities, by B. I. Gilman.
A theory of probable inference, by C. S. Peirce.
A note on an eight-term logical machine.

Seven numbers of the University Circulars, containing 162 quarto pages, have also been issued during the year. The Circulars are published at convenient intervals during the academic year for the purpose of communicating intelligence to the various members of the University in respect to work which is here in progress, as well as for the

purpose of promulgating official announcements from the governing and teaching bodies. Although these Circulars are designed for the members of the University, they have frequently been called for by institutions and libraries at a distance, and also by individuals who are interested in the literary and scientific activity of this University. Subscriptions and exchanges are therefore received.

HONORARY HOPKINS SCHOLARSHIPS.

In addition to the ordinary scholarships already established, eighteen honorary Hopkins scholarships have been instituted for the encouragement of conspicuous merit among undergraduate students who regularly matriculate. Six of these scholarships will be annually offered to such candidates "from the States of Maryland, Virginia, and North Carolina, as may be most deserving of choice, because of their character and intellectual promise." Two of these six scholarships are open to candidates from each of the States above named.

The value of each scholarship is \$250 per annum and free tuition; and in case the holder of a scholarship withdraws from the University, for any reason, during the course of a session, such part of the allowance will be paid as seems equitable to the executive committee.

RECENT CHANGES IN THE ACADEMIC STAFF.

The additions to the academic staff since the date of the last report, are as follows:

As stated above, Dr. Paul Haupt, Professor extraordinarius of Assyriology in the University of Göttingen, has accepted a call to this university as professor of the Shemitic languages. His distinguished fitness for this post is recognized abroad and at home.

In June last, Dr. J. S. Billings, Surgeon U. S. A., was appointed Professor of Hygiene in the Medical Faculty, but his relations to the Surgeon General's office precluded his acceptance. He has, however, consented, while continuing to act as a medical adviser to the Trustees of the Johns Hopkins Hospital, to be a University lecturer on Hygiene and questions of public sanitary science.

Simultaneously with the appointment of Dr. Billings the Trustees, foreseeing the commencement of instruction in the medical sciences, designated Dr. Remsen and Dr. Martin to be respectively professors of Chemistry and Physiology in the faculty of medicine. The nucleus of an organization is thus secured, consisting of the President of the University, two scientific professors and a lecturer; and it is expected that a professor of Pathology will be next appointed.

By an act of the Trustees, in 1883, the rank of Associate Professor was formally instituted, and the persons below named, all of whom had previously been Associates, were promoted to it, viz: Messrs. H. B. Adams, M. Bloomfield, W. K. Brooks, T. Craig, C. S. Hastings, H. N. Morse, W. E. Story, and M. Warren.

Professor Hiram Corson, LL. D., of Cornell University, has been appointed Lecturer on English Literature. His course for the year 1882-3 was on Poetry; that for 1883-4 is on the Literature of the Restoration Period in England.

Professor W. Trelease, of the University of Wisconsin, has been appointed Lecturer on Botany for the current year.

Dr. W. T. Sedgwick, having been called to the Massachusetts Institute of Technology, resigned his position here as an Associate in Biology. The assistants in that department for the current year are Messrs. H. H. Donaldson, H. W. Conn, and Otto Lügger.

George H. Williams, Ph. D. of Heidelberg, recently a pupil of Rosenbusch, has become an Associate in Mineralogy, and is giving instruction in that subject, especially in the most recent methods of petrographic investigation.

E. M. Hartwell, Ph. D. and M. D., has been appointed Instructor in Physical Culture, with especial reference to the exercises which are to be promoted in the new gymnasium.

Arrangements have been made with Mr. Hugh Newell by which he will hereafter give a much larger amount of time to the instruction in Drawing. Classes in freehand and in instrumental drawing will meet five times a week from one o'clock until dark.

Mr. H. A. Todd, a graduate of Princeton, and for several years a student of the Romance Languages in Europe, has been added to the staff as an instructor in French.

G. T. Dippold, Ph. D., late of the Boston University, is the instructor of the major and minor classes in German, for the current year.

**CO-OPERATION WITH OTHER INSTITUTIONS. RELATIONS
TO THE PUBLIC.**

The Johns Hopkins University continues to be desirous of co-operating with other agencies for the advancement and diffusion of knowledge, and as it grows, its relations are more and more extended. By means of its publications, it maintains a system of correspondence and exchanges with universities and learned societies throughout the world. Its participation in the electrical congress at Paris, and in the U. S. astronomical expedition to the Caroline island, have already been mentioned. For several years the Chesapeake Zoological laboratory has been co-operating with the Fish Commission of the State of Maryland to determine, if

possible, the conditions essential to the perpetuation of the oyster growth in the Chesapeake. At the request of Professor Baird, secretary of the Smithsonian Institution, and chief of the U. S. Fish Commission, a subscription was made for a table in the new marine laboratory to be established at Wood's Holl. Several members of the university made a private subscription for the maintenance of a student at Dohrn's laboratory, Naples, though their purposes were not carried out on account of arrangements made elsewhere for the same end. In association with a few other American institutions, a moderate sum is annually paid toward the maintenance of a School of Classical Studies at Athens, under the auspices of a committee appointed by the Archæological Institute of America. The recently published volume of the Archives of Maryland, issued by the Maryland Historical Society in accordance with an Act of the Legislature, was prepared for the press under the editorial care of our librarian, Dr. Wm. Hand Browne.

With the consent of the authorities of the university, but at the expense of several ladies who are engaged in teaching, a course of lectures on physics was given last winter by Dr. Hastings, to a company of young ladies who were studying this subject at school and were desirous of seeing the requisite demonstrations of physical phenomena. The suc-

cess of these lectures was such as to make it certain that some such courses of instruction should be annually provided. A course of historical lectures was given by Dr. Adams, by invitation of the Peabody Institute, in the month of February, as in previous years courses were given by Prof. Remsen and Dr. Hastings. Prof. Martin is to lecture, in the winter of 1883-4. As in many former years, frequent lectures have been given by members of the university staff, at the request of local committees in different parts of Baltimore—and the hall of the university has been repeatedly used for the promotion of educational and philanthropic movements in which all the community are interested.

Interest in the lectures given in Hopkins Hall appears to be undiminished, and it is more and more obvious that a larger room is needed for these and all our general gatherings.

Partly to interest the community in the university, and partly to bring together the workers of all departments, who are somewhat inclined to remain hidden in their special places of study and research, frequent social reunions have been held. The annual celebration occurred on February 22, 1883. Hopkins Hall was filled in the afternoon, by the members of the University and their friends, assembled to hear an address from Hon. S. Teackle Wallis, LL. D., of the Bar of Baltimore,

who took for his theme the relations of the University to the City. His discourse was received with great favor and was afterwards widely distributed, in our circulars and in a pamphlet form, among the citizens of Baltimore, many of whom, undoubtedly, first became acquainted with the aims and methods of this foundation through the clear exposition of this able speaker. In the evening of the same day there was an assembly of ladies and gentlemen in the public rooms of the University. The usual social receptions were likewise given at the beginning and end of the term, and in the course of the year there were two special gatherings,—one, when the enlarged chemical laboratory was thrown open to the public, after an address from Professor Remsen; the other, when the Bluntschli library was presented by some of the German citizens of Baltimore, and speeches were made by Col. Raine, on the part of the donors, Judge Dobbin on the part of the Trustees, and Dr. Adams on the part of students in History.

On the occasion last mentioned, the cast of an original likeness in bas-relief of Chief Justice Marshall was presented to the University by Major Innes Randolph. The present Chief Justice, Hon. M. R. Waite, LL. D., accepted an invitation to be present on this occasion, and made a brief address commemorative of the character of his predecessor in office.

It is pleasant to record the increasing evidences of the friendly encouragement of the citizens of Baltimore. Not only from individuals but from organized associations and institutions frequent tokens of co-operation and good will have been received.

CONCLUSION.

It is a great satisfaction to look back for seven years without recalling one instance of disorder among the students, or a single breach in the official harmony prevailing between the trustees and the academic staff, and between the workers in different branches of study. This has been secured by obedience to unwritten law,—by a willing conformity to the ideas with which the trustees in their earliest proceedings inspired the organization. It was required of them to found and maintain a University. In the exercise of this trust, constant reference was made to the present condition of learning, to the experience of kindred institutions, to the aspirations of far-sighted men, and to the immediate needs of this country, and of the State of Maryland. In adjusting conflicting interests, and in determining what course to pursue, when so many inviting paths were open, mutual concessions were requisite. No individual can claim that his views were decisive. In the adoption of important measures

there has been prolonged discussion, and an earnest endeavor to ascertain what would best promote the noble purpose of this foundation.

In looking forward to the immediate future, it appears that the time has nearly come to reduce to writing, the laws and customs which are now observed. Nearly three times as many students and twice as many resident teachers are now enrolled upon our calendar as there were in the first year. With these increasing numbers and with the enlargement of our buildings, good administration becomes constantly more difficult; good legislation more called for. We are actually working out a system of government, based indeed upon experience elsewhere,—but adapted to our own needs. Before long, it will be advisable to state our ways and usages, and define the rights and duties of the various authorities whose harmonious action is essential to the working of this intricate organism. But we must take care that we do not thus dull the enthusiasm, check the growth, or destroy the life which has been so vigorous during this first septennial period.

Experience has shown that we were wise at the outset in including a college department in the university organization. We have steadily endeavored to work out a plan of study adapted to the youth who come to us from the Baltimore City College on the one hand, and from the private

schools on the other. The result has been that we have enrolled as matriculated students a company of excellent scholars, whose steady intellectual growth it is a delight to watch. I have already stated that the discussions of the last year resulted in arrangements for the improvement of the college course;—and I look forward to the day when instead of a few scores of young men from Baltimore, we shall have hundreds availing themselves of the great advantages which have been brought to their very doors.

I can never rid myself of the belief that the essential value of the university does not depend upon the discoveries it makes, or the knowledge it accumulates and imparts, but in the characters which it develops. In the hunt for truth, we are not first hunters, and then men; we are first and always men, then hunters. While it is easy to think of brilliant examples of self-taught writers and discoverers, universities and colleges are the ordinary training places for the leaders of human thought. Therefore nothing which is degrading should be tolerated within their walls; all that is ennobling should be encouraged. Healthy, graceful, and temperate bodies, always under command; manners which spontaneously show the consideration due to superiors, inferiors, and equals; quick, accurate, discriminating, and retentive minds; skilful modes of

expression, with the pen, the tongue, and the pencil; stores of knowledge, and the power of greater acquisition; correct habits of thought and action, and an abiding love of truth—these should be the results of a liberal education. But it is never to be forgotten that more important still is the sense of responsibility to God and man, and an ever conscious acknowledgment of the power of an endless life.

DANIEL C. GILMAN.

BALTIMORE, *October*, 1888.

APPENDIX.

A.

Academic Staff, 1876-83.

The names in each group are arranged in the order of appointment. The column of dates indicates the period during which the particular station referred to has been held. In consequence of promotions some names appear in several groups.

PRESIDENT.

DANIEL C. GILMAN, 1875-

PROFESSORS.

BASIL L. GILDERSLEEVE, *Greek*, 1876-
 J. J. SYLVESTER,* . . . *Mathematics*, 1876-
 IRA REMSEN, *Chemistry*, 1876-
 HENRY A. ROWLAND, . . . *Physics*, 1876-
 H. NEWELL MARTIN, . . . *Biology*, 1876-
 CHARLES D. MORRIS, . . . *Classics, (Collegiate)*, . . 1876-
 PAUL HAUPT, *Shemitic Languages*, . . 1888-

ASSOCIATE PROFESSORS.

HERBERT B. ADAMS, . . . *History*, 1883-
 MAURICE BLOOMFIELD, . . *Sanskrit*, 1883-
 WILLIAM K. BROOKS, . . . *Morphology*, 1883-
 THOMAS CRAIG, *Applied Mathematics*, . . 1883-
 CHARLES S. HASTINGS, . . *Physics*, 1883-
 HARMON N. MORSE, . . . *Chemistry*, 1883-
 WILLIAM E. STORY, . . . *Mathematics*, 1883-
 MINTON WARREN, *Latin*, 1883-

* Professor Sylvester, having consented to stand as a candidate for the Savilian Professorship of Geometry in the University of Oxford, tendered his resignation to the Trustees of the Johns Hopkins University to take effect January 1, 1884. In accepting it, the Trustees appointed him Professor *emeritus*.

ASSOCIATES.

JOHN M. CROSS, . . .	<i>Greek, . . .</i>	. 1876-1881.
PHILIP R. UHLER, . . .	<i>Natural History, . . .</i>	. 1876-
AUSTIN SCOTT, . . .	<i>History, . . .</i>	. 1876-1882.
A. MARSHALL ELLIOTT, . . .	<i>Romance Philology, . . .</i>	. 1876-
THOMAS C. MURRAY, . . .	<i>Shemitic, . . .</i>	. 1876-1879.
HEERMAN C. G. BRANDT, . . .	<i>German, . . .</i>	. 1876-1882.
WILLIAM K. BROOKS, . . .	<i>Biology, . . .</i>	. 1876-1883.
HARMON N. MORSE, . . .	<i>Chemistry, . . .</i>	. 1876-1883.
ROBERT RIDGWAY, . . .	<i>Natural History, . . .</i>	. 1876-1877.
WILLIAM E. STORY, . . .	<i>Mathematics, . . .</i>	. 1876-1888.
ARTHUR W. TYLER, . . .	<i>Librarian, . . .</i>	. 1876-1878.
CHARLES S. HASTINGS, . . .	<i>Physics, . . .</i>	. 1876-1883.
CHARLES R. LANMAN, . . .	<i>Sanskrit, . . .</i>	. 1877-1880.
HERBERT B. ADAMS, . . .	<i>History, . . .</i>	. 1878-1883.
ALBERT S. COOK, . . .	<i>English, . . .</i>	. 1879-1881.
MINTON WARREN, . . .	<i>Latin, . . .</i>	. 1879-1883.
WILLIAM HAND BROWNE, . . .	<i>Librarian, . . .</i>	. 1879-
HENRY SEWALL, . . .	<i>Biology, . . .</i>	. 1880-1882.
THOMAS CRAIG, . . .	<i>Mathematics, . . .</i>	. 1880-1883.
MAURICE BLOOMFIELD, . . .	<i>Sanskrit, . . .</i>	. 1881-1883.
WILLIAM T. SEDGWICK, . . .	<i>Biology, . . .</i>	. 1881-1883.
HENRY WOOD, . . .	<i>English, . . .</i>	. 1881-
FABIAN FRANKLIN, . . .	<i>Mathematics, . . .</i>	. 1882-
RICHARD T. ELY, . . .	<i>Political Economy, . . .</i>	. 1882-
J. FRANKLIN JAMESON, . . .	<i>History, . . .</i>	. 1883-
GEORGE H. WILLIAMS, . . .	<i>Mineralogy, . . .</i>	. 1883-

LECTURERS.

SIMON NEWCOMB, . . .	<i>Astronomy, . . .</i>	. 1876.
LÉONCE RABILLON, . . .	<i>French, . . .</i>	. 1876-
JOHN S. BILLINGS, . . .	<i>Medical History, etc., . . .</i>	. 1877.
FRANCIS J. CHILD, . . .	<i>Early English, etc., . . .</i>	. 1877-1878.
THOMAS M. COOLEY, . . .	<i>Law, . . .</i>	. 1877-1879.
JULIUS E. HILGARD, . . .	<i>Geodetic Surveys, . . .</i>	. 1877.
JAMES RUSSELL LOWELL, . . .	<i>Romance Literature, . . .</i>	. 1877.
JOHN W. MALLET, . . .	<i>Technological Chemistry, . . .</i>	. 1877-1878.
FRANCIS A. WALKER, . . .	<i>Political Economy, . . .</i>	. 1877-1878.

WILLIAM D. WHITNEY,	. Comparative Philology,	. 1877.
WILLIAM F. ALLEN,	. History, . . . .	. 1878.
WILLIAM JAMES,	. Psychology, . . . .	. 1878.
GEORGE S. MORRIS,	. Philosophy, . . . .	. 1878-
J. LEWIS DIMAN,	. History, . . . .	. 1879.
H. VON HOLST,	. History, . . . .	. 1879.
WILLIAM G. FARLOW,	. Botany, . . . .	. 1879.
J. WILLARD GIBBS,	. Theoretical Mechanics,	. 1879.
SIDNEY LANIER,	. English Literature, .	. 1879-1881.
CHARLES S. PEIRCE,	. Logic, . . . .	. 1879-
JOHN TROWBRIDGE,	. Physics, . . . .	. 1880.
A. GRAHAM BELL,	. Phonology, . . . .	. 1881.
S. P. LANGLEY,	. Physics, . . . .	. 1881.
JOHN MCCRADY,	. Biology, . . . .	. 1881.
JAMES BRYCE,	. Political Science, .	. 1881.
EDWARD A. FREEMAN,	. History, . . . .	. 1881.
JOHN J. KNOX,	. Banking, . . . .	. 1881.
ARTHUR CAYLEY,	. Mathematics, . . .	. 1882.
WILLIAM W. GOODWIN,	. Plato, . . . .	. 1882.
G. STANLEY HALL,	. Psychology, . . . .	. 1882-
RICHARD M. VENABLE,	. Constitutional Law, .	. 1882.
JAMES A. HARRISON,	. Anglo-Saxon, . . .	. 1882.
J. RENDEL HARRIS,	. New Testament Greek,	. 1882-
GEORGE W. CABLE,	. English Literature, .	. 1888.
HIRAM CORSON,	. English Literature, .	. 1888-
F. SEYMOUR HADEN,	. Etchers and Etching,	. 1888.
JOHN S. BILLINGS,	. Municipal Hygiene, .	. 1888.
JAMES BRYCE,	. Roman Law, . . . .	. 1888.
H. VON HOLST,	. Political Science, .	. 1888.
WILLIAM TRELEASE,	. Botany, . . . .	. 1884.
J. THACHER CLARKE,	. Archæology, . . . .	. 1884.

INSTRUCTORS AND ASSISTANTS.

HENRY SEWALL,	. Biology, . . . .	. 1876-1878.
SAMUEL F. CLARKE,	. Biology, . . . .	. 1879-1881.
FABIAN FRANKLIN,	. Mathematics, . . .	. 1879-1882.
LYMAN B. HALL,	. Chemistry, . . . .	. 1879-1880.
CHRISTIAN SIHLER,	. Biology, . . . .	. 1879-1880.

HENRY C. ADAMS, . . .	<i>Political Economy,</i> . . .	1879-1881.
THOMAS CRAIG, . . .	<i>Mathematics,</i> . . .	1879-1880.
CHAS. L. WOODWORTH, JR. . .	<i>Elocution,</i> . . .	1879-
WILLIAM T. SEDGWICK, . . .	<i>Biology,</i> . . .	1880-1881.
EDWIN H. HALL, . . .	<i>Physics,</i> . . .	1880-1881.
GEORGE H. STOCKBRIDGE, . . .	<i>Latin and German,</i> . . .	1880-1881.
PHILIPPE B. MARCOU, . . .	<i>French,</i> . . .	1880-1883.
HUGH NEWELL, . . .	<i>Drawing,</i> . . .	1880-
R. DORSEY COALE, . . .	<i>Chemistry,</i> . . .	1881-1883.
RICHARD T. ELY, . . .	<i>Political Economy,</i> . . .	1881-1882.
LAWRENCE B. FLETCHER, . . .	<i>Physics,</i> . . .	1881.
GEORGE F. NICOLASSEN, . . .	<i>Greek and Latin,</i> . . .	1881-1882.
BENJAMIN E. SMITH, . . .	<i>Philosophy,</i> . . .	1881-1882.
EDMUND B. WILSON, . . .	<i>Biology,</i> . . .	1881-1882.
JAMES W. BRIGHT, . . .	<i>German,</i> . . .	1882-1883.
J. FRANKLIN JAMESON, . . .	<i>History,</i> . . .	1882-1883.
EDWARD H. SPIEKER, . . .	<i>Greek and Latin,</i> . . .	1882-
HARRY F. REID, . . .	<i>Physics,</i> . . .	1882-
CHARLES F. RADDATZ, . . .	<i>German,</i> . . .	1882-
EDWARD M. HARTWELL, . . .	<i>Physical Culture,</i> . . .	1883-
HERBERT W. CONN, . . .	<i>Osteology,</i> . . .	1883-
G. THEODORE DIPPOLD, . . .	<i>German,</i> . . .	1883-
HENRY H. DONALDSON, . . .	<i>Animal Physiology,</i> . . .	1883-
HENRY A. TODD, . . .	<i>Romance Languages,</i> . . .	1883-
OTTO LUGGER, . . .	<i>Curator of Biol. Museum,</i> . . .	1883-

B.

Roll of Fellows.

The following list gives the names of all persons who have been selected by the authorities and appointed to fellowships. Though, in a few cases, by reason of promotion or other causes, the persons designated have not entered upon the fellowships, their names are given to exhibit fully the working of this system of appointment.

The present position or residence of the former holders of fellowships is, in most cases, given after the name.

-
- HENRY C. ADAMS, PH. D., . . . *Political Science*, . . . 1876-1879
Non-Resident Professor, Cornell University; Lecturer on Political Economy, University of Michigan.
- HERBERT B. ADAMS, PH. D., . . . *History*, . . . 1876-1878.
Associate Professor of History, Johns Hopkins University.
- WILLIAM K. BROOKS, PH. D., . . . *Biology*, . . . 1876.
Associate Professor of Morphology, and Director of Chesapeake Zoological Laboratory, Johns Hopkins University. (*Appointed Associate before entering on the Fellowship*).
- THOMAS CRAIG, PH. D., . . . *Mathematics*, . . . 1876-1879.
Associate Professor of Applied Mathematics, Johns Hopkins University.
- JOSHUA W. GORE, C. E., . . . *Mathematics*, . . . 1876-1878.
Professor of Natural Philosophy and Engineering, University of North Carolina.
- GEORGE B. HALSTED, PH. D., . . . *Mathematics*, . . . 1876-1878.
Instructor in the Graduate Courses of Mathematics, Princeton College.
- EDWARD HART, PH. D., . . . *Chemistry*, . . . 1876-1878.
Assistant Professor of Chemistry, Lafayette College.
- DANIEL W. HERING, C. E., . . . *Engineering*, . . . 1876-1878.
Professor of Mathematics, Western Maryland College.
- MALVERN W. ILES, PH. D., . . . *Chemistry*, . . . 1876-1878.
Chemist, Leadville, Colorado.
- WILLIAM W. JACQUES, PH. D., . . . *Physics*, . . . 1876-1879.
Electrician of the American Bell Telephone Co., Boston, Mass.
- CHARLES R. LANMAN, PH. D., . . . *Sanskrit*, . . . 1876-1877.
Professor of Sanskrit, Harvard University.
- D. MCGREGOR MEANS, A. B., . . . *Political Science*, . . . 1876-1877.
Late Professor of Political and Mental Science, Middlebury College; Attorney at Law, New York City.
- HARMON N. MORSE, PH. D., . . . *Chemistry*, . . . 1876.
Associate Professor of Chemistry, Johns Hopkins University. (*Appointed Associate before entering upon the Fellowship*).
- WALTER H. PAGE, . . . *Greek*, . . . 1876-1878.
Late Professor in the Louisville (Ky.) High School.
- P. PORTER POINIER, M. E., . . . *Physics*, . . . 1876.
(*Died without entering upon the Fellowship, June, 1876, aged 23 years*).
- E. DARWIN PRESTON, C. E., . . . *Engineering*, . . . 1876-1878.
U. S. Coast and Geodetic Survey, Washington, D. C.
- HENRY J. RICE, SC. D., . . . *Biology*, . . . 1876-1878.
Professor of Natural Sciences, Brooklyn (N. Y.) High School.

- JOSIAH ROYCE, PH. D., *Philosophy*,ⁱ 1876-1878.
Instructor in Philosophy, Harvard University.
- ERNEST G. SIHLER, PH. D., *Greek*, 1876-1879.
Classical Instructor, New York City.
- FREDERICK B. VAN VORST, A. B., . . . *Ethics & Metaphysics*, 1876-1877.
Attorney at Law, New York City.
- JOHN H. WHEELER, PH. D., *Philology*, 1876-1877.
Professor of Greek, University of Virginia.
- SAMUEL F. CLARKE, PH. D., *Biology*, 1876-1879.
Professor of Natural History, Williams College.
- LYMAN B. HALL, PH. D., *Chemistry*, 1877-1879.
Professor of Chemistry and Physics, Haverford College, Pa.
- A. DUNCAN SAVAGE, B. LITT., *Greek*, 1876-1879.
- FABIAN FRANKLIN, PH. D., *Mathematics*, 1877-1879.
Associate in Mathematics, Johns Hopkins University.
- CHRISTIAN SIHLER, PH. D., *Biology*, : 1877-1879.
Physician, Cleveland, Ohio.
- FRANCIS G. ALLINSON, PH. D., *Greek and Sanskrit*, . . 1877-1880.
Assistant Professor of Greek and Latin, Haverford College, 1880-82; Classical Instructor, Baltimore.
- MAURICE BLOOMFIELD, PH. D., *Sanskrit and Greek*, . . 1878-1879.
Associate Professor of Sanskrit, Johns Hopkins University.
- CONSTANTINE FAHLBERG, PH. D., *Chemistry*, 1878-1880.
Chemist, Gray's Ferry Chemical Works, Philadelphia.
- EDWIN H. HALL, PH. D., *Physics*, 1878-1880.
Instructor in Physics, Harvard University.
- EDWARD COLES HARDING, A. M., *Greek*, 1878-1879.
Professor of Greek, University of Louisiana, 1879-80.
- ISAAC OTT, M. D., *Biology*, 1878-1879.
Physician, Easton, Pa.
- HENRY SEWALL, PH. D., *Biology*, 1878-1879.
Professor of Physiology, University of Michigan.
- WASHINGTON I. STRINGHAM, PH. D., . . . *Mathematics*, 1878-1880.
Professor of Mathematics, University of California.
- ABRAM V. E. YOUNG, PH. B., *Chemistry*, 1878-1880.
- CHARLES R. HEMPHILL, A. M., *Greek*, 1878-1879.
Associate Professor of Biblical Literature, Theological Seminary, Columbia, S. C.
- ALLAN MARQUAND, PH. D., *Logic and Ethics*, . . 1877-1880.
Professor of the History of Art, Princeton College.
- CHARLES A. VAN VELZER, S. B., *Mathematics*, 1878-1881.
Assistant Professor of Mathematics, University of Wisconsin.
- BROWN AYRES, S. B., *Physics*, 1879-1880.
Professor of Physics, University of Louisiana, New Orleans.
- LOUIS BEVIER, PH. D., *Greek*, 1879-1881.
Instructor in Languages, Rutgers College, N. J.
- EDWARD M. HARTWELL, PH. D., *Biology*, 1879-1881.
Instructor in Physical Culture, Johns Hopkins University.
- JOHN R. MCD. IRBY, PH. D., *Mineralogy*, 1879-1880.
(Died, March 25, 1880, aged 25 years).

- MITSURU KUHARA, PH. D.** . . . *Chemistry*, . . . 1879-1881.
Curator of the Scientific Museums, University of Tokio, Japan.
- OSCAR H. MITCHELL, PH. D.** . . . *Mathematics*, . . . 1879-1882.
Professor of Mathematics, Marietta College.
- EDWARD L. NICHOLS, PH. D.** . . . *Physics*, . . . 1879-1880.
Professor of Physics and Chemistry, Central University, Richmond, Ky.
- WALDO S. PRATT, A. M.** . . . *Aesthetics, etc.*, . . . 1879-1880.
Instructor in Ecclesiastical Music, Theological Seminary, Hartford, Conn.
- WILLIAM T. SEDGWICK, PH. D.** . . . *Biology*, . . . 1879-1880.
Assistant Professor of Biology, Massachusetts Institute of Technology.
- HERMANN VOORHEES, C. E.** . . . *Chemistry*, . . . 1879.
(*Died without entering on the Fellowship, October 14, 1879, aged 27 years.*)
- CHARLES O. WHITMAN, PH. D.** . . . *Biology*, . . . 1879.
Professor of Zoology, University of Tokio, Japan. 1879-81; Marine Station, Naples, 1881-82. (*Resigned before entering on the Fellowship.*)
- EDMUND B. WILSON, PH. D.** . . . *Biology*, . . . 1879-1881.
Lecturer on Biology, Williams College.
- GEORGE F. NICOLASSEN, PH. D.** . . . *Greek*, . . . 1879-1881.
Professor of Greek and Latin, Southwestern Presbyterian University, Tenn.
- WILLIAM BURNET, PH. D.** . . . *Chemistry*, . . . 1879-1880.
Professor of Chemistry, South Carolina Agricultural College.
- ROBERT W. PRENTISS, S. B.** . . . *Mathematics*, . . . 1879-1881.
Office of U. S. Nautical Almanac, Washington, D. C.
- JAMES W. BRIGHT, PH. D.** . . . *Teutonic Languages*, . . . 1880-1882.
Student of Philology in Europe.
- BENJAMIN C. BURT, A. M.** . . . *Philosophy*, . . . 1880-1881.
Assistant Professor of English and Rhetoric, University of Michigan.
- SPENCER H. FREEMAN, A. M.** . . . *Physics*, . . . 1880-1882.
Professor of Physics and Astronomy, Adelbert College, Cleveland, Ohio.
- KAKICHI MITSUKURI, PH. D.** . . . *Biology*, . . . 1880-1881.
Professor of Zoology, University of Tokio, Japan.
- BERNARD F. O'CONNOR, PH. D.** . . . *Romance Languages*, . . . 1880-1882.
Instructor in French, Columbia College.
- CHASE PALMER, PH. D.** . . . *Chemistry*, . . . 1880-1882.
Professor of Chemistry, Massachusetts State Normal School, Salem.
- HERBERT M. PERRY, A. B.** . . . *Mathematics*, . . . 1880-1882.
- WILLIAM L. ROWLAND, S. B.** . . . *Chemistry*, . . . 1880.
(*Did not enter upon the Fellowship.*)
- EDWARD H. SPIEKER, PH. D.** . . . *Greek*, . . . 1880-1882.
Assistant in Greek and Latin, Johns Hopkins University.
- MORRISON I. SWIFT, A. B.** . . . *Philosophy*, . . . 1880-1882.
Instructor in Logic and Political Economy, Hobart College.
- ARTHUR W. WHEELER, A. B.** . . . *Physics*, . . . 1880-1881.
(*Died, January 6, 1881, aged 21 years.*)
- R. DORSEY COALE, PH. D.** . . . *Chemistry*, . . . 1880-1881.
Lecturer on Chemistry, University of Maryland.
- A. F. WILHELM SCHIMPER, PH. D.** . . . *Biology*, . . . 1880-1881.
University of Bonn, Germany.
- LAWRENCE B. FLETCHER, PH. D.** . . . *Physics*, . . . 1880-1881.
Instructor in Physics, Wesleyan University, Middletown, Conn.

- WILLIAM J. ALEXANDER, PH. D., . . . *Greek*, . . . 1881-1888.
Student of Philology in Europe.
- EDWARD S. BURGESS, A. B., . . . *Greek*, . . . 1881-1882.
Instructor, Washington (D. C.) High School.
- WILLIAM J. COMSTOCK, PH. B., . . . *Chemistry*, . . . 1881-1882.
Student of Chemistry, University of Munich.
- WILLIAM C. DAY, PH. D., . . . *Chemistry*, . . . 1881-1883.
Professor of Chemistry and Physics, St. John's College, Md.
- HENRY H. DONALDSON, A. B., . . . *Biology*, . . . 1881-1883.
Assistant in Biology, Johns Hopkins University.
- WILLIAM P. DUFEE, PH. D., . . . *Mathematics*, . . . 1881-1883.
Instructor in charge of the department of Mathematics, Hobart College.
- GEORGE S. ELY, PH. D., . . . *Mathematics*, . . . 1881-1883.
Professor of Mathematics, Buchtel College.
- J. FRANKLIN JAMESON, PH. D., . . . *History*, . . . 1881-1882.
Associate in History, Johns Hopkins University.
- C. HERSCHEL KOYL, A. B., . . . *Physics*, . . . 1881-1883.
- HENRY L. OSBORN, A. B., . . . *Biology*, . . . 1881-1882.
Fellow by Courtesy, Johns Hopkins University.
- HENRY N. STOKES, S. B., . . . *Biology*, . . . 1881-1883.
Fellow by Courtesy, Johns Hopkins University.
- BENJAMIN W. WELLS, PH. D., . . . *English*, . . . 1881.
Instructor in English, Friends' School, Providence, R. I.
- BENJAMIN I. GILMAN, A. B., . . . *Logic*, . . . 1881-1882.
Student in Harvard University.
- CHARLES J. BELL, A. B., . . . *Chemistry*, . . . 1882.
Professor of Chemistry, Pennsylvania State College, Center Co., Pa. (*Did not enter upon the Fellowship*).
- JAMES M. CATTELL, A. B., . . . *Philosophy*, . . . 1882-1883.
- ELLERY W. DAVIS, S. B., . . . *Mathematics*, . . . 1882-
- DAVID T. DAY, A. B., . . . *Chemistry*, . . . 1882-
- ALFRED EMERSON, PH. D., . . . *Greek*, . . . 1882-
- WILLIAM S. FLEMING, A. B., . . . *Greek*, . . . 1882-1883.
Professor of Greek and German, Davidson College.
- ARTHUR L. FROTHINGHAM, JR., PH. D., *Shemitic Languages*, 1882-
- HENRY R. GOODNOW, A. B., . . . *Physics*, . . . 1882-1883.
Fellow by Courtesy, Johns Hopkins University.
- ELGIN R. L. GOULD, A. B., . . . *History*, . . . 1882-
- ARTHUR S. HATHAWAY, S. B., . . . *Mathematics*, . . . 1882-
- WILLIAM H. HOWELL, A. B., . . . *Biology*, . . . 1882-
- ARTHUR L. KIMBALL, A. B., . . . *Physics*, . . . 1882-1883.
Fellow by Courtesy, Johns Hopkins University.
- HARRY F. REID, A. B., . . . *Physics*, . . . 1882.
Assistant in Physics, Johns Hopkins University.
- EDWARD H. KEISER, S. B., . . . *Chemistry*, . . . 1882-
- WILLIAM M. ARNOLT, B. D., . . . *Greek*, . . . 1882-
- GUSTAV BISSING, A. B., . . . *Mathematics*, . . . 1883-

ADAM T. BRUCE, A. B., . . .	<i>Biology,</i> . . .	1888-
ARCHIBALD L. DANIELS, A. B., .	<i>Mathematics,</i> . . .	1888-
JOHN DEWEY, A. B., . . .	<i>Philosophy,</i> . . .	1888-
JAMES R. DUGGAN, A. B., . .	<i>Chemistry,</i> . . .	1888-
HANS C. G. VON JAGEMANN, . .	<i>Modern Languages,</i> .	1888-
GUSTAV A. LIEBIG, JR., A. B., .	<i>Physics,</i> . . .	1888-
C. W. EMIL MILLER, A. B., . .	<i>Greek,</i> . . .	1888-
CHARLES A. PERKINS, A. B., . .	<i>Physics,</i> . . .	1888-
LEWIS T. STEVENS, A. B., . .	<i>Biology,</i> . . .	1888-
LEWIS W. WILHELM, A. B., . .	<i>History,</i> . . .	1888-

C.
Graduates.

DEGREES CONFERRED HONORIS CAUSA.

1880..

HENRY A. ROWLAND, PH. D.
Professor of Physics, Johns Hopkins University.

1881.

RUTHERFORD B. HAYES, LL. D.
President of the United States.

DEGREES CONFERRED ON EXAMINATION.

1878.

DOCTORS OF PHILOSOPHY.

- HENRY CARTER ADAMS. (F).
A. B., Iowa, 1874.—Lecturer on Political Economy, University of Michigan; Non-Resident Professor of Political Economy, Cornell University.
- THOMAS CRAIG. (F).
C. E., Lafayette, 1875.—Associate Professor of Mathematics, Johns Hopkins University.
- JOSIAH ROYCE. (F).
A. B., Univ. of California, 1875.—Instructor in Philosophy, Harvard University.
- ERNEST GOTTLIEB SIHLER. (F).
Concordia, 1869.—Classical Instructor, New York City. (4)

1879.

DOCTORS OF PHILOSOPHY.

- MAURICE BLOOMFIELD. (F).
A. M., Furman, 1877.—Associate Professor of Sanskrit, Johns Hopkins University.
- SAMUEL FESSENDEN CLARKE. (F).
Ph. B., Yale, 1878.—Professor of Natural History, Williams College.
- GEORGE BRUCE HALSTED. (F).
A. B., Princeton, 1875.—Instructor in the Graduate Courses of Mathematics, Princeton College.
- EDWARD HART. (F).
S. B., Lafayette, 1874.—Assistant Professor of Chemistry, Lafayette College.
- WILLIAM WHITE JACQUES. (F).
S. B., Mass. Inst. of Technology, 1876.—Electrician, Boston, Mass.
- HENRY SEWALL. (F).
S. B., Wesleyan, 1876.—Professor of Physiology, University of Michigan. (6)

F. Holders of Fellowships.

BACHELORS OF ARTS.

- GEORGE WASHINGTON MCCREARY.**
Engaged in mercantile pursuits, Baltimore.
- CHASE PALMER. (F).**
Professor of Chemistry, Massachusetts State Normal School.
- EDWARD HENRY SPIKKER. (F).**
Assistant in Greek and Latin, Johns Hopkins University. (3)

1880.

DOCTORS OF PHILOSOPHY.

- FRANCIS GREENLEAF ALLINSON. (F).**
A. B., Haverford, 1876; A. B., Harvard, 1877.—Late Assistant Professor of Greek and Latin, Haverford College; Classical Instructor, Baltimore.
- FABIAN FRANKLIN. (F).**
Ph. B., Columbian, 1869.—Associate in Mathematics, Johns Hopkins University.
- EDWIN HERBERT HALL. (F).**
A. B., Bowdoin, 1875.—Instructor in Physics, Harvard University.
- ALLAN MARQUAND. (F).**
A. B., Princeton, 1874.—Professor of the History of Art, Princeton College.
- WASHINGTON IRVING STRINGHAM. (F).**
A. B., Harvard, 1877.—Professor of Mathematics, University of California. (5)

BACHELORS OF ARTS.

- THOMAS MILTON BEADENKOPF.**
Student of Theology, Boston University.
- ALLAN KERR BOND.**
M. D., University of Maryland, 1882.—Physician, Baltimore.
- WILLIAM CATHCART DAY. (F).**
Professor of Chemistry and Physics, St. John's College.
- HENRY LAURENCE GANTT.**
Late Instructor, McDonogh School; Student in the Stevens Institute of Technology.
- EDGAR GOODMAN.**
LL. B., University of Maryland, 1881.—Attorney at Law, Baltimore.
- CARL ECKHARDT GRAMMER.**
Student of Theology, Virginia Theological Seminary.
- ALEXANDER FRIDOE JAMIESON.**
Instructor, Trenton, N. J.
- *EDMUND ALLEN JARVIS.**
Died, October 15, 1880, aged 22 years.
- STEWART BRIAN LINTHICUM.**
LL. B., University of Maryland, 1882.—Attorney at Law, Portland, Oregon.
- JOHN HANSON LOWE.**
LL. B., University of Maryland, 1882.—Attorney at Law, Baltimore.
- LEIGH CLINTON MORGAN.**
Minister of the Protestant Episcopal Church, Brooklyn, N. Y.
- NELSON PALMER.**
Baltimore.
- THOMAS PETTIGREW.**
Creswell, N. C.

- HARRY FIELDING REID.** (F).
Assistant in Physics, Johns Hopkins University.
- WILTZ RAYMOND STRICKLEN.**
Minister of the Methodist Episcopal Church, Maryland.
- LEWIS WEBB WILHELM.** (F).
Fellow, Johns Hopkins University.

(16)

1881.

DOCTORS OF PHILOSOPHY.

- LOUIS BEVIER.** (F).
A. B., Rutgers, 1878.—Student of Philology in Europe.
- ROBERT DORSEY COALE.** (F).
Lecturer on Chemistry, University of Maryland.
- EDWARD ALLEN FAY.**
A. B., University of Michigan, 1862.—Professor of History and Languages, National Deaf-Mute College.
- LAWRENCE BUNTING FLETCHER.** (F).
A. B., Columbia, 1877.—Instructor in Physics, Wesleyan University.
- SAMUEL GARNER.**
A. B., St. Johns, 1871.—Professor of Modern Languages, University of Indiana.
- EDWARD MUSSEY HARTWELL.** (F).
A. B., Amherst, 1873; M. D., Miami Medical College, 1882.—Instructor in Physical Culture, Johns Hopkins University.
- WILLIAM THOMPSON SEDGWICK.** (F).
Ph. B., Yale, 1877.—Assistant Professor of Biology, Massachusetts Institute of Technology.
- CHRISTIAN SIHLER.** (F).
Concordia, 1866.—Physician, Cleveland, O.
- EDMUND BEECHER WILSON.** (F).
Ph. B., Yale, 1878.—Lecturer on Biology, Williams College.

(9)

BACHELORS OF ARTS.

- WILLIAM WILSON BADEN.**
LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.
- HENRY JOHNS BOWDOIN.**
LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.
- JOHN WILSON BROWN.**
Baltimore.
- DAVID TALBOTT DAY.** (F).
Fellow, Johns Hopkins University.
- WILLIAM HENRY HOWELL.** (F).
Fellow, Johns Hopkins University.
- JOHN JOHNSON.**
Instructor, McDonogh School.
- JAMES EDWARD KEELER.**
Assistant, Allegheny (Pa.) Astronomical Observatory; now studying in Berlin.
- EDWIN GEORGE RICHARDSON.**
Clergyman of the Protestant Episcopal Church, Newark, N. J.
- ADONIRAM JUDSON ROBINSON.**
Instructor in Baltimore City College.

HENRY ROLANDO.

M. D., University of Maryland, 1883.—now connected with Presbyterian Hospital, New York City.

LEE SALE.

Student of Law, Louisville, Ky.

MACTIER WARFIELD.

Student of Medicine, University of Maryland.

(12)

1882.

DOCTORS OF PHILOSOPHY.

JAMES WILSON BRIGHT. (F).

A. B., Lafayette, 1877.—Student of Philology in Europe.

JOHN FRANKLIN JAMESON. (F).

A. B., Amherst, 1879.—Associate in History, Johns Hopkins University.

MITSURU KUHARA. (F).

S. B., University of Tokio, 1877.—Curator of the Museums, University of Tokio.

ROBERT W. MAHON.

C. E., Lehigh, 1876.—Adjunct Professor of Chemistry, Lafayette College.

OSCAR HOWARD MITCHELL. (F).

A. B., Marietta, 1875.—Professor of Mathematics, Marietta College.

GEORGE FREDERICK NICOLASSEN. (F).

A. B., University of Virginia, 1879.—Professor of Ancient Languages, Southwestern Presbyterian University.

WILLIAM ALBERT NOYES.

A. B., Iowa, 1879.—Professor of Chemistry, University of Tennessee.

CHASE PALMER. (F.)

A. B., Johns Hopkins, 1879.—Professor of Chemistry, Mass. State Normal School.

EDWARD HENRY SPIEKER. (F).

A. B., Johns Hopkins, 1879.—Assistant in Greek and Latin, Johns Hopkins University. (9)

BACHELORS OF ARTS.

WILLIAM HUGHLETT ADKINS.

LL. B., University of Maryland, 1883.—Attorney at Law, Maryland.

THOMAS ALEXIS BERRY.

Graduate Student, Johns Hopkins University.

GUSTAV BISSING. (F).

Fellow, Johns Hopkins University.

WALTER BERNARD CLARKSON.

Principal of the Duval High School, Jacksonville, Fla.

HERMANN LOUIS EBELING.

Instructor, Bloomfield, N. J.

LOUIS GARTHE.

Graduate Student, Johns Hopkins University.

EDWARD INGLE.

Graduate Student, Johns Hopkins University.

RICHARD FULLER KIMBALL.

Student of Law, University of Maryland.

GUSTAV ADOLPH LIEBIG, JR. (F).

Fellow, Johns Hopkins University.

CHARLES WILLIAM EMIL MILLER. (F).

Fellow, Johns Hopkins University.

JAMES PAGE.

Graduate Student, Johns Hopkins University.

ALBERT GALLATIN PALMER.

Graduate Scholar, Johns Hopkins University.

ROBERT MILLER REESE.

Baltimore.

LEWIS TEBBETTS STEVENS. (F).

Fellow, Johns Hopkins University.

HERBERT THORNDYKE TIFFANY.

Student of Law, Baltimore.

(15)

1883.**DOCTORS OF PHILOSOPHY.****WILLIAM JOHN ALEXANDER. (F).**

A. B., University of London, 1876.—Student of Philology in Europe.

WILLIAM CATHCART DAY. (F).

A. B. Johns Hopkins University, 1880.—Professor of Chemistry and Physics, St. John's College, Maryland.

WILLIAM PITT DURFEE. (F).

A. B., University of Michigan, 1876.—Instructor in Mathematics, Hobart College.

GEORGE STETSON ELY. (F).

A. B., Amherst College, 1878.—Professor of Mathematics, Buchtel College.

KAKICHI MITSUKURI. (F).

Ph. B., Yale College, 1879.—Professor of Zoölogy, University of Tokio, Japan.

BERNARD FRANCIS O'CONNOR. (F).

Bach. ès Lettres, Université de France, 1874.—Instructor in French, Columbia College.

(6)

BACHELORS OF ARTS.**WILLIAM SHIRLEY BAYLEY.**

Graduate Student, Johns Hopkins University.

MAURICE FELS.

Student of Law, Philadelphia.

DAVID STERRETT GITTINGS.

Student of Law, Baltimore.

WILLIAM BEATTY HARLAN.

Student of Law, University of Maryland.

GEORGE THEOPHILUS KEMP.

Graduate Student, Johns Hopkins University.

GONZALEZ LODGE.

Graduate Scholar, Johns Hopkins University.

WILLIAM EDGAR STRATTON.

Student of Medicine, Harvard University.

HENRY WINSLOW WILLIAMS.

Engaged in Civil Engineering, (B. & O. R. R.)

HENRY VANPETERS WILSON.

Graduate Student, Johns Hopkins University.

WILLIAM JOHN WITZENBACHER.

Instructor in the McDonogh School.

(10)

TOTAL (1878-83.)

DOCTORS OF PHILOSOPHY,	39
BACHELORS OF ARTS,	56

D.

Report of the Chesapeake Zoölogical
Laboratory,

During its first six years, 1878-83.

To the President of the Johns Hopkins University:

SIR: In accordance with your request to prepare an outline or summary of the work of the marine laboratory during the six years of its existence, I have the pleasure to submit in connection with the report of the sixth session, the following review of the history of the five preceding years.

FIRST YEAR, (1878), AT FORT WOOL, VA.

In 1878, the Trustees of the Johns Hopkins University made a small appropriation, in order to enable a party of biological students to spend a few weeks at the seashore in the study of marine zoölogy under my direction. Permission was given us by the Secretary of War, through the influence of Maj. Gen. Q. A. Gillmore, to occupy the vacant buildings at Fort Wool. Prof. Spencer F. Baird also exerted his influence with the Secretary of War in our behalf, and aided us in many other ways; furnishing us with dredging apparatus and with three small row boats, which were used during the summer. The vacant buildings at Fort Wool were not sufficient for our accommodation, as only one of them was in sufficiently good repair for use, and the watchman in charge of the fort, Mr. Allen, readily consented to vacate for us all but one of the rooms in his house, and much of the success of our first season was due to his interest in our work.

Three students, who were not connected with the University, asked for permission to join our party, which, with these additions, consisted of eight persons, and we remained at the fort for seven weeks.

The scientific results of our season's work were printed in an illustrated volume, the cost of publishing which was born by citizens of Baltimore, among whom were Samuel M. Shoemaker, John W. Garrett, John W. McCoy, Enoch Pratt, P. R. Uhler, President Gilman, Professor Martin, and others.

Among these papers the most noteworthy were one on the "Development of *Lingula*" and one on the "Early Stages of *Squilla*." Both of these papers were reprinted in foreign journals, and their contents have since been incorporated in the best foreign text-books of zoölogy, such as Claus' "Zoölogie" and Balfour's "Comparative Embryology."

SECOND YEAR, (1879), AT CRISFIELD, MD., AND FORT WOOL, VA.

The appropriation for the maintenance of the laboratory was continued by the Trustees of the University for the next year.

In order to present an opportunity for studying the oyster beds of the Bay, and thus secure the coöperation of Maj. Ferguson, Assistant U. S. Fish Commissioner, I determined to open the laboratory at Crisfield, a point which is unfavorable in most other respects. The laboratory was accordingly opened at Crisfield on the 25th of June in three of the barges of the Maryland Fish Commission.

I stated in the preliminary announcement that the laboratory would be moved to some more desirable locality farther down the Bay, about July 10, but the transportation of the barges was attended with so much expense that I was not able to move them to the second station, and we occupied them at Crisfield until August 8. During part of this time, Maj. Ferguson's steam yacht, the Lookout, which he had fitted up with steam dredging apparatus for the purpose, was with us, and rendered valuable help in dredging and collecting. Through Maj. Ferguson's influence we also had the use of a small steam launch which was detailed for the purpose from the U. S. Navy.

Early in August the mosquitoes became so numerous as to render the barges uninhabitable, and we transferred our outfit to our old quarters at Fort Wool, which had again been placed at our service by Maj. Gen. Q. A. Gillmore, U. S. A., and where Mr. Allen again placed his private quarters at our service.

At the beginning of this session, which lasted for eleven weeks, a circular was issued by the University inviting other naturalists to avail themselves of our facilities, upon the payment of a small fee, and some of our party of twelve were persons who came from other institutions.

Among the more important of the published results of this season's work were a paper on the Development of the Oyster, one on the Metamorphosis of *Phornis*, one on the Development of the Squid, and one on the Metamorphosis of *Panopæus*.

THIRD, FOURTH, AND FIFTH YEARS, (1880-82), AT BEAUFORT, N. C.

The next year, the Trustees of the University voted to continue the laboratory for three years more, and they provided a liberal annual appropriation for the current expenses, and they also voted that the sum of \$4,500 be appropriated for the purchase of outfit, &c. After an examination of all the available localities, the town of Beaufort, N. C., about four hundred miles south of Baltimore, was selected as the site for the laboratory, and as a vacant house, suitable for the accommodation of a small party, was found there, it was rented for three years, and as none of the \$4,500 was needed for the erection of a building, most of it was used, by the permission of the Trustees, in the purchase of two boats, for collecting. One of these, a Herreshoff launch, twenty-seven feet long, and

eight feet beam, was built for us in 1880, and the second, a sloop forty-seven feet long, and fourteen feet beam, was purchased in the summer of 1883.

The natural advantages of Beaufort are very great, as the fauna is exceptionally rich and varied, abounding in forms which are of peculiar interest.

The configuration of our coast line is such that Cape Hatteras, the most projecting point south of New York, deflects the warm water of the Gulf Stream away from the coast, and thus forms an abrupt barrier between a cold northern coast and a warm southern one. The fauna north of this barrier passes gradually into that of Southern New England, while the fauna south of the barrier passes without any abrupt change into that of Florida, but the northern fauna is sharply separated by Cape Hatteras from the southern.

As the laboratory of the U. S. Fish Commission and Mr. Agassiz's laboratory at Newport afford opportunities for work upon the northern fauna, it seemed best for us to select a point south of Cape Hatteras in order to study the southern fauna with the same advantages, and as Beaufort is the only town near the Cape which can be reached without difficulty, it was chosen as the best place for the laboratory.

The situation of this town is exceptionally favorable for zoölogical work, for the surrounding waters present such a diversity of conditions that the fauna is unusually rich and varied.

Close to the town there are large sand bars, bare for miles at low tide, and abounding in animal life. From these we could collect an unfailing supply of *Amphioxus*, *Renilla*, *Limulus*, *Balanoglossus*, Sea Urchins, and a great variety of Molluscs and Crustacea.

The mud flats furnished us with another fauna, and yielded a great variety of Annelids, a new set of species of Crustacea and Molluscs, Gephyreans, Echinoderms, and Polyps. The large salt marshes gave us a third fauna, and a short distance inland large swamps of brackish and fresh water furnished still other conditions of life.

As the town is situated at the point where Gore Sound connects Pamlico Sound with Bogue Sound, we were within easy reach of a continuous sheet of landlocked salt water more than a hundred miles long, and these Sounds furnished still another collecting and dredging ground, abounding in Corals, Gorgonias, Ascidians, Star Fish, Sea Urchins, and a new set of Molluscs and Crustacea.

As most of the shores are flat and sandy those animals which live upon a sandy bottom are much more abundant than those which attach themselves to solid bodies, but the stone breakwaters at Fort Macon, the wharves at Beaufort and Morehead City, and the large oyster beds which are found in the Sounds furnish a proper habitat for many fixed animals, and yielded us a rich supply of Hydroids, Corals, Ascidians, Sea Anemones, Sponges, Cirripeds, &c. The ocean beach within a short distance of the town furnished still another fauna, and a sail of three miles from the laboratory carried us to a good locality for ocean dredging.

The greatest advantage of the locality is the richness of its pelagic fauna. There are very few points upon land which are so situated that the surface animals of mid-ocean can be procured in abundance for laboratory work, and as careful work is very difficult on shipboard, a laboratory which can be supplied with a good number of living pelagic animals presents opportunities for work in an extremely interesting and almost new field.

The Gulf Stream is constantly sweeping these animals northwards along the North Carolina coast, and as the tide sets in through Beaufort Inlet into the Sounds the floating animals are carried with it. Such oceanic animals as *Physalia* and *Porpita* were frequently thrown, uninjured and in perfect health, upon the beach within twenty feet of the laboratory, and during the season we found nearly all the *Siphonophora* which are known to occur upon our Atlantic coast.

With all these advantages we enjoyed a mild and uniform climate which enabled us to work in perfect comfort during the hottest months of summer.

The zoological resources of Beaufort have not escaped the attention of American naturalists, and there are few places upon our coast, outside of New England, where more zoological work has been done. In 1860, Drs. Stimpson and Gill spent a season in dredging and collecting in the vicinity of Beaufort, Cape Lookout, and Cape Hatteras, and an account of their work was published in the *American Journal of Science*. Dr. Coues, who was stationed at Fort Macon during the war, occupied himself for two years in collecting the animals which are found here, and he published a series of papers on the "Natural History of Fort Macon and Vicinity" in the *Proceedings of the Academy of Natural Sciences of Philadelphia*.

These papers, which were continued by Dr. Yarrow, contain copious and valuable notes on the habits and distribution of the animals which were observed, and we found them a great help to us. These two naturalists found four hundred and eighty species of animals in the vicinity of Beaufort. Of these four hundred and eighty, two hundred and ninety-eight are vertebrates, and one hundred and eighty-two are invertebrates. Of the vertebrates twenty-four are mammals, one hundred and thirty-three are birds, twenty-seven are reptiles, six batrachians, ninety-seven fishes and eleven selachians. Of the invertebrates one hundred and forty-seven are molluscs, twenty-one are crustaceans. The list of vertebrates is very nearly complete, and we made few additions to it, but the list of invertebrates is obviously very imperfect, and, although we made no attempt to tabulate the species which we observed, there would be no difficulty in enlarging the list twenty or thirty fold.

Among other naturalists who have spent more or less time at Beaufort, I may mention Professor L. Agassiz, Professor E. S. Morse, Dr. A. S. Packard, Professor Webster, and Professor D. S. Jordan. Professor Morse procured most of the material for his well known paper on the Systematic Position of the Brachiopoda on the sand bars in Beaufort Inlet.

During the years 1880, 1881, and 1882, the laboratory at Beaufort was occupied by our party for sixty-four weeks in all, and twenty-two persons availed themselves of its facilities for research.

Among the published results of our investigations, lists of which have been printed in your annual reports, two papers deserve especial mention.

One of these, a monograph on the Development of *Lucifer*, has been printed with eleven quarto plates in the *Philosophical Transactions of the Royal Society*, while another on the Anatomy and Development of *Renilla*, with fourteen plates, is now in the press of the Royal Society, and is to appear soon.

SIXTH YEAR, (1883), AT HAMPTON, VA.

In the spring of 1883, the Trustees of the University voted to continue the annual appropriation for the current expenses of the laboratory for two years more.

My duties this summer as a Commissioner, appointed by the Governor of Maryland to examine the condition of the oyster beds of the State, compelled me to spend the season in the Chesapeake Bay, and the removal of the laboratory from Beaufort, N. C., where it had been for three years, was therefore decided upon.

The absence of buildings for the accommodation of our party at any suitable point upon the Bay except at Fort Wool and Hampton, restricted us to these two places in our selection of a laboratory. Application was made to the Secretary of War, through Maj. Gen. Q. A. Gillmore, for permission to occupy the buildings at Fort Wool, and this permission was granted; but upon visiting the fort I found the buildings so ruinous, and the wharf so injured by storms, that I decided that it would not be prudent for our party to spend the season there, and as Gen. S. C. Armstrong, the President of the Hampton Normal and Industrial Institute, kindly consented to permit our party to use an unoccupied building which had just been erected by the Institute as a machine shop, the second floor and attic were rented by the University for the season, and were occupied by the members of our party from May 1 to October 1.

The second floor room, which is large and well lighted, furnished ample laboratory accommodations, and the attic was used as lodgings.

The location was found to be a bad one, as the collecting grounds were distant and far apart, and the fauna was not rich, but researches were carried on upon the following subjects, among others: the anatomy and development of barnacles, the anatomy and development of crabs, the histology of *Eudendrium*, the anatomy and development of *Balanoglossus*, the development of the oyster, the anatomy of *Lingula*, the protozoæa stage of crabs, the development of Annelids, the anatomy and development of *Chrysaora*, the origin of the eggs of hybrids and tunicates, the function of the semi-circular canals of sharks, and the general zoölogy of the Hydro-Medusæ. Most of my own time for the last year has been given to the study of the oyster industry of Maryland, and my results

will be stated in the report of the Oyster Commission, which is now in press.

PROPAGATION OF THE OYSTER.

During the past year experiments which have been carried on in France and in this country have resulted in the practical application of the methods of artificial oyster propagation, which were discovered at the laboratory five years ago, and the great economic importance of the subject will justify a short review of the history of these experiments.

Previously to 1879 our knowledge of the breeding habits of the oyster was entirely based upon the study of the oysters of northern Europe, and nothing whatever was known of the life history of the American oyster, as our writers had accepted without question the statements of foreign authorities. The oyster of northern Europe is hermaphrodite, and as the eggs are hatched inside the shell of the parent, and the young are thus carried and protected until they are ready to fasten themselves, good authorities had stated that it is not possible to rear oysters artificially.

In 1879, I found that the sexes are separate in the American oyster, and that the unfertilized eggs are thrown out in immense numbers into the water, where they are fertilized and develop without the need for any protection from their parents. I also showed that it is possible to fertilize the eggs artificially, and to rear the young oysters until long after they have acquired their shells, although I did not succeed in keeping them alive until they became attached. These experiments showed the perfect practicability of rearing oysters in unlimited numbers, as soon as the practical difficulties should be overcome.

A full account of my experiments and of the methods employed was published with figures of the early stages of the development of the oyster, in the first volume of the *Studies from the Biological Laboratory*.

While I was engaged in these experiments, Lieutenant Winslow, U. S. N., was engaged in surveying the oyster beds near the laboratory, which he visited in order to learn my methods. The next year, while stationed at Cadiz, Spain, he repeated the experiments with Portuguese oysters, and found that their breeding habits are exactly like those of the American species; that the sexes are separate; that the unfertilized eggs are thrown out into the water, and that the young can be reared from artificially fertilized eggs.

An account of his experiments was read before the Maryland Academy of Sciences in November, 1880, and it was afterwards published in the *American Naturalist*.

The next step which has resulted in the solution of the practical difficulties, and the rearing of oysters of economic value from artificially impregnated eggs, is due to experiments which were carried on by M. Bouchen-Brandely, under the auspices of the French Government.

In a paper, entitled "Rapport relatif à la génération et à la fécondation artificielle des huîtres, adressé au ministre de la marine et des colonies par Bouchen-Brandely, secrétaire du Collège de France," and published in

December, 1882, in the *Journal officiel de la République Française*, this author states that he was encouraged by the experiments which Brooks, of the Johns Hopkins University of Baltimore, had made upon *Ostrea virginica*, to attempt similar experiments with the Portuguese oyster, *Ostrea angulata*. He was ignorant of Winslow's experiments with this oyster, but after two years of experiments, he succeeded in independently establishing the fact that the sexes of the Portuguese oyster are separate; that the eggs are thrown out into the water; that the young are independent of parental protection, and that they can be reared from artificially fertilized eggs.

The methods by which he succeeded in rearing these young oysters are described in his report as follows. Two oyster planting ponds, separated from each other by a straight massive wall of earth, and having an area of about 100 metres each, and an average depth of about 1 metre, were placed in communication by means of a pipe which was closed at each end by a sponge, to filter sediment from the water and to guard against the accidental introduction of spat. The outlet from the ponds was guarded by a dam of fine sand confined between boards, and thus allowing the water to escape, but retaining the swimming embryos. Artificially impregnated eggs were then poured into the lower pond in great numbers during the latter part of June and the month of July. The pond was furnished with tiles for the attachment of the spat, and on July 24th each of these tiles was found to have, attached to its surface, twenty or thirty young oysters, about two-fifths of an inch in diameter. Finally, during the early part of October he states that he had the honor of presenting to the minister of the marine a tile, upon which two thousand young oysters could be counted, measuring from two-fifths to four-fifths of an inch in diameter.

This interesting paper, which has been translated into English by J. A. Ryder, and published in the *Bulletin of the U. S. Fish Commission* for April 19, 1888, shows the practicability of the economic application of the more purely scientific experiments which were carried on at our laboratory in 1879. The author acknowledges that he was incited by these experiments, and our own share in the work is therefore exactly what we should wish: the discovery of a new scientific truth, which has, in the hands of practical economists, contributed to the welfare of mankind.

Mr. John A. Ryder has this summer repeated these experiments in Maryland, and has shown that they are as successful here as they are in France. An account of his apparatus and of the results obtained has been published in the *Bulletin of the U. S. Fish Commission* for September 6, 1888, under the title "Rearing Oysters from Artificially Fertilized Eggs, together with notes on Pond Culture, &c.," by John A. Ryder.

SUMMARY.

During the six years of its existence, work has been carried on at the laboratory for one hundred and five weeks in all. It was attended by nine persons in 1878; by twelve in 1879; by six in 1880; by twelve in

1881; by eight in 1882; and by sixteen in 1883, thus making the total attendance sixty-three. The number of persons who have used the laboratory is only forty however, as many of them have spent two or three seasons there. One-half of the attendants were members of the Johns Hopkins University, and the rest were then or now connected with the Smithsonian Institution; the United States Fish Commission; the Academy of Natural Sciences, Philadelphia; University of Cambridge (St. John's College), England; the Ontario Agricultural College, Canada; or with the American colleges and schools indicated in the subjoined roll.

The scientific papers which have been published by our party, based wholly or in part upon the work done at the laboratory, include fifty-five titles, and they have been printed in the following journals: *Studies from the Biological Laboratory*; *Johns Hopkins University Circulars*; *American Naturalist*; *American Journal of Science*; *Memoirs of the Boston Society of Natural History*; *Zoologischer Anzeiger*; *London Quarterly Journal of Microscopical Science*; *Proceedings and Philosophical Transactions of the Royal Society*, London. Many of the papers have been reprinted, or summarized in foreign journals, but translations and summaries are not included in the enumeration given above.

A medal of the first class of the Société d'Acclimatation of Paris and one of the Walker Prizes of the Boston Society of Natural History have been awarded to members of our party for work which was done at the laboratory.

Within the last year Professor Mitsukuri, a naturalist who received his training in zoölogical research at our marine laboratory, has organized a similar laboratory on the coast of Japan, as a branch of the Government University of Tokio.

Yours respectfully,

W. K. BROOKS,

Director Chesapeake Zoölogical Laboratory.

ROLL OF THE CHESAPEAKE ZOÖLOGICAL LABORATORY, 1878-88.

Director.

W. K. BROOKS, Ph. D.

Members.

J. E. ARMSTRONG, *Assistant in Natural History, Illinois Industrial University. (1881.)*

B. W. BARTON, M. D., *Baltimore. (1879.)*

W. BATESON, *St. Johns College, University of Cambridge, England. (1882.)*

EMIL BESSELS, M. D., *Smithsonian Institution. (1879.)*

E. A. BIRGE, *Professor of Zoölogy, University of Wisconsin. (1879.)*

- S. F. CLARKE, Ph. D., *Professor of Natural History, Williams College.* (1879, '81.)
- BUCK P. COLTON, A. B., *Teacher, Natural Science, Princeton (Ill.) High School.* (1881)
- H. W. CONN, A. M., *Johns Hopkins University.* (1882, '83.)
- CHARLES EARLE, *New York.* (1883.)
- H. C. EVARTS, M. D., *Philadelphia.* (1879, '80.)
- H. GARMAN, *Assistant, Illinois State Laboratory of Natural History.* (1883.)
- O. P. JENKINS, A. M., *Johns Hopkins University.* (1883.)
- J. W. KING, *Professor of Natural Science, Wisconsin State Normal School.* (1880.)
- F. S. LEE, A. M., *Johns Hopkins University.* (1883.)
- K. MITSUKUKI, Ph. D., *Professor of Zoölogy, University of Tokio, Japan.* (1879, '80.)
- J. PLAYFAIR McMURRICH, *Professor of Biology, Ontario Agricultural College, Guelph, Ont.* (1881, '83.)
- T. W. MILLS, M. D., *Montreal, Quebec.* (1883.)
- H. F. NACHTRIEB, S. B., *Johns Hopkins University.* (1883.)
- W. L. NORRIS, *Arlington, Ill.* (1881.)
- E. A. NUNN, *Professor of Biology, Wellesley College, Mass.* (1879.)
- H. L. OSBORN, A. B., *Johns Hopkins University.* (1882, '83.)
- HENRY F. OSBORNE, A. B., *Fellow, College of New Jersey.* (1880.)
- J. H. PILLSBURY, *Professor of Natural Science, Springfield (Mass.) High School.* (1882, '83.)
- H. J. RICE, M. S., *Teacher of Natural Science, Brooklyn, N. Y.* (1879, '81.)
- FERNANDO SANFORD, *Professor, Natural Sciences, Mount Morris College, Ill.* (1881.)
- AUGUST SCHMIDT, *Teacher of Natural Science, Baltimore.* (1878, '79.)
- H. SEWALL, Ph. D., *Professor of Physiology, University of Michigan.* (1878, '81, '83.)
- C. SIHLER, Ph. D., *Physician, Cleveland, Ohio.* (1878, '79.)
- W. E. STRATTON, A. B., *Johns Hopkins University.* (1883.)
- A. H. TUTTLE, S. B., *Professor of Zoölogy, Ohio State University, Columbus, Ohio.* (1883.)
- JOHN M. TYLER, A. B., *Professor of Zoölogy, Amherst College.* (1882.)
- P. R. UHLE, *Associate in Natural History, J. H. U.* (1881.)
- N. B. WEBSTER, *Principal, Military Academy, Norfolk, Va.* (1878.)
- T. B. WEBSTER, *Teacher, Military Academy, Norfolk, Va.* (1878.)
- E. B. WILSON, Ph. D., *Lecturer on Biology, Williams College.* (1879-82.)
- H. V. WILSON, A. B., *Johns Hopkins University.* (1883.)
- J. M. WILSON, M. D., *Ann Arbor, Mich.* (1882.)
- FRANCIS WINSLOW, *Lieut. United States Navy, United States Fish Commission.* (1882, '83.)

PUBLISHED RESULTS OF SCIENTIFIC RESEARCH AT THE CHESAPEAKE
ZOOLOGICAL LABORATORY, 1878-88.

W. K. BROOKS, PH. D.:

- The Development of Lingula and the Systematic Position of the Branchiopoda. (*Scientific Results, Chesapeake Zool. Lab.*, 1879; *Arch. f. Zool. exp.*, 1881.)
 The Larval Stages of Squilla empusa. (*Scientific Results, Chesapeake Zool. Lab.*, 1879.)
 Abstract of Observations on the Development of the American Oyster. (*Zool. Anzeiger*, 1879.)
 The Artificial Fertilization of Oyster Eggs and the Propagation of the American Oyster. (*Am. Jour. of Science*, 1879.)
 The Development of the American Oyster. (*Report of the Maryland Fish Commission, and Studies from the Biol. Lab., J. H. U.*, 1880.)
 The Acquisition and Loss of a Food Yolk in Molluscan Eggs. (*Studies from the Biol. Lab., J. H. U.*, 1880; 10 plates.)
 The Development of the Cephalopoda and the Homology of the Cephalopod Foot. (*Am. Jour. of Science*, 1880.)
 The Rhythmical Character of Segmentation. (*Am. Jour. of Science*, 1880.)
 Budding in Free Medusae. (*Am. Nat.*, Sept., 1880.)
 Embryology and Metamorphosis of the Sergestidae. (*Zool. Anzeiger*, Nov., 1880.)
 The Young of the Crustacean Lucifer, A Nauplius. (*Am. Nat.*, Nov., 1880.)
 The Development of the Squid. (*Anniv. Mem., Boston Soc. Nat. Hist.*, March, 1881; 3 plates.)
 Alternation of Periods of Rest with Periods of Activity in the Segmenting Eggs of Vertebrates. (*Studies from the Biol. Lab., J. H. U.*, 1881; 1 plate.)
 The First Zoes of Porcellana. (With E. B. WILSON; *Studies from the Biol. Lab., J. H. U.*, 1881; 2 plates.)
 List of the Medusae of Beaufort, N. C. I. (*Studies from the Biol. Lab., J. H. U.*, 1882.)
 Origin of the Eggs of Salpa. (*Studies from the Biol. Lab., J. H. U.*, 1882; 1 plate.)
 Lucifer: A Study in Morphology. (*Proc., Royal Soc., London*, 1881.)
 The Development of Lucifer. (*Phil. Trans. Royal Soc., London*, 1882; 11 plates.)
 Handbook of Invertebrate Zoölogy. (*Boston, Cassino*, 1882.)
 Charnisso and the Discovery of Alternation of Generations. (*Zool. Anzeiger*, 1882.)
 The Development of the Digestive Tract in Molluscs. (*Proc., Boston Soc. Nat. Hist.*, 1879.)
 The Metamorphosis of Alpheus. (*Univ. Circular*, No. 17.)
 The Metamorphosis of Penaeus. (*Univ. Circular*, No. 19.)
 On the Origin of Alternation of Generations in Hydro-Medusae. (*Univ. Circular*, No. 22; *Ann. of Nat. Hist.*, Vol. 11, p. 455.)
 Notes on the Medusae of Beaufort, N. C. II. (*Studies from the Biol. Lab., J. H. U.*, 1883.)
 The Law of Heredity. (*Baltimore, Murphy*, 1883.)

W. BATESON:

- Abstract of Observations on the Development of Balanoglossus. (*Univ. Circular*, No. 27.)

H. G. BRYNER, M. D.—(See H. W. Conn.)

E. A. BIRGE:

- Notes on the Development of Panopaeus Sayi. (*Studies from the Biol. Lab., J. H. U.*, 1883, 4 plates.)

S. F. CLARKE, PH. D.:

- New Hydroids from Chesapeake Bay. (*Boston Soc. Nat. Hist.*, 1882.)

B. P. COLTON, A. B.—(See H. Garman.)

H. W. CONN, A. M.:

- Development of Tubularia Cristata. (*Univ. Circular*, No. 17.)
 On Radial and Bilateral Symmetry in Animals. (*Univ. Circular*, No. 22; *Ann. of Nat. Hist.*, Vol. 12, p. 69; *Journal Royal Mic. Soc.*, Vol. 3, p. 633.)
 An Instance of Sexual Variation in the Crustacea. (*Univ. Circular*, No. 27.)
 Evidence of a Protozoa Stage in Crab Development. (*Univ. Circular*, No. 28.)

- The Nervous System of Porpita. (With H. G. BEYER. *Studies from the Biol. Lab. J. H. U.*, 1888, 1 plate.)
- On the Development of Crabs. (*Studies from the Biol. Lab., J. H. U.*, in press.)
- H. GARMAN:
- List of a few additions to the Species of Birds, Reptiles, and Batrachians mentioned in Dr. Elliott Coues' paper on the Natural History of Fort Macon and Vicinity. (*Univ. Circular*, No. 22.)
- Development of *Arbacia punctulata*. (With B. P. COLTON. *Studies from the Biol. Lab., J. H. U.*, 1881.)
- J. P. McMURRICH:
- Origin of the so-called Test Cells in the Ascidian ovum. (*Studies from the Biol. Lab., J. H. U.*, 1882.)
- Abstract of Observations on the Osteology and Development of *Syngnathus Peckeanus* (Storer.) (*Univ. Circular*, No. 27.)
- On the Osteology and Development of *Syngnathus Peckeanus* (Storer.) (*Quart. Journal Micros. Science*, Vol. XXIII, 2 plates.)
- K. MITSUKURI, PH. D.:
- On the Structure and Significance of some Abberant Forms of Lamellibranchiate Gills. (*Quar. Jour. Micros. Sci.*, July, 1881; *Studies from the Biol. Lab., J. H. U.*, 1882)
- H. L. OSBORN, A. B.:
- The Structure and Growth of the Shell of the Oyster. (*Studies from the Biol. Lab., J. H. U.*, 1882, 1 plate.)
- On the Growth of the Molluscan Shell. (*Univ. Circular*, No. 27; *Ann. of Nat. Hist.* Vol. 11, p. 149; *Am. Nat.*, Vol. 17, p. 96; *Journal Royal Micros. Soc.*, Vol. 3, p. 195.)
- On the Gills of Gasteropods. (*Studies from the Biol. Lab., J. H. U.*, in press.)
- Also see J. M. WILSON.
- H. SEWALL, PH. D.:
- On the Equilibrium Function of the Membranous Labyrinth in Cartilaginous Fishes. (*Univ. Circular*, No. 12.)
- P. R. UHLER:
- List of Animals observed at Fort Wool, Va. (*Studies from the Biol. Lab. J. H. U.*, 1879.)
- N. B. WEBSTER:
- Partial List of Land Plants at Fort Wool, Va. (*Studies from the Biol. Lab., J. H. U.*, 1879.)
- E. B. WILSON, PH. D.:
- The Early Stages of Renilla. (*Am. Jour. of Science*, 1880)
- Origin and Significance of the Metamorphosis of Actinotrocha. (*Quar. Jour. of Micros. Sc.*, April, 1881, 2 plates; *Abstract in Am. Nat.*, 1882.)
- The First Zœa of Porcellana. (With W. K. BROOKS; *Studies from the Biol. Lab., J. H. U.*, 1881, 2 plates.)
- Observations on the Early Developmental Stages of some Polychæstous Annelides. (*Studies from the Biol. Lab., J. H. U.*, 1882; *Abstract in Zool. Anzeiger*, 1880, and in *Am. Jour. of Science*, 1880.)
- A New Species of Plidium. (*Studies from the Biol. Lab., J. H. U.*, 1882.)
- Abstract of Observations on the Structure and Development of Renilla and Leptogorgia. (*Univ. Circular*, No. 17.)
- The Development of Renilla. (*Proc., Royal Soc., London*, No. 222; *Univ. Circular*, No. 22.)
- Also see J. M. WILSON and W. K. BROOKS.
- J. M. WILSON, M. D.:
- Variation in the Segmentation of the Egg of Renilla. (With E. B. WILSON and H. L. OSBORN; *Zool. Anzeiger*, 1882, No. 123.)

Dr. E. B. Wilson's monograph on the Development of Renilla is now in print, and it will soon appear with sixteen quarto plates, in the *Philosophical Transactions of the Royal Society*. Several other papers are now ready for publication. One of these, a paper on the Development of *Thalassima*, by Mr. H. W. Conn, has received one of the Walker prizes of the Boston Society of Natural History.

H.

Gifts to the Library from September 1,
1882, to September 1, 1883.

- ACADEMIA REAL DAS SCIENCIAS, LISBON, PORTUGAL. Arana. Vida e viagens de Magalhães. Lisbon, 1881. O.
 Ribeiro. Calderon de la Barca. Lisbon, 1881. O.
 Shakespeare. Hamlet. Trad. de B. Pato. Lisbon, 1879. O.
 Shakespeare. Mercador de Veneza. Trad. de B. Pato. Lisbon, 1881. O.
 ADDEMAN, HON. J. M. Secretary of State of Rhode Island. State Laws and Documents.
 ASIATIC SOCIETY OF BENGAL. Bibliotheca Indica (a large collection of Sanskrit texts) and other publications. Calcutta. O.
 Oriental Biographical Dictionary. Calcutta, 1881. Q.
 ATKINSON, W. B., M. D. Phila. Transactions Amer. Medical Association. 1882. O.
 BALLARD, R. (Author). Solution of the Pyramid Problem. New York, 1882. O.
 BAXTER, J. H., M. D. Washington. Medical Statistics of Prov. Marshal Gen'l's Bureau, Washington, 1875. 2 vols. Q.
 BERGSEN'S MUSEUM. (Norway.) Koren and Danielssen. Fauna littoralis Norvegiæ. Bergen, 1856-77. 2 vols. F.
 BILLINGS, J. S., M. D. Index-Catalogue, Library of Surgeon Gen'l's Office. Vol. 3. Washington, 1882. Q.
 BROWN, HON. GEORGE WILLIAM. Law Tracts and Political Pamphlets.
 CIVIL SERVICE REFORM ASSOCIATION. Publications.
 COOPER, P. (Author). Ideas of a Science of Good Government. New York, 1883. O.
 COURTESAY, HON. W. A. (Mayor of Charleston, S. C.) Year-Book of the City of Charleston, 1880-81. Charleston, 1881-82. 2 vols. O.
 DAWES, HON. J. W. (Governor of Nebraska). Laws and Reports of State Officers.
 DOBBIN, HON. G. W. Cæsar, De Bello Gallico. Lugduni, 1574. D.
 ELY, R. T. Municipal Documents of Berlin and other cities; Finance Reports, etc.
 FREEMAN, E. A. Historical Pamphlets and Magazines.
 FRIEDENWALD, A., M. D. Liber Cosri. Ed. J. Buxtorf. Basileæ, 1660. D.
 GILMAN, PREST. D. C. Baltimore's 150th Anniversary Celebration. Baltimore, 1881. O.
 Harris. Lexicon Technicum. London, 1710. F.
 GORMAN, HON. A. P. U. S. Government Publications.
 GREEN, S. A., M. D., Boston. Reports of Record Commissioners of Boston. Boston, v. d. 6 vols. O.
 Hall. The Dutch and Iroquois. New York, 1882. O.
 Old State House Memorial. Boston, 1882. O.
 Statistics of Boston. Boston, 1882. O.
 GWINN, HON. C. J. M. Alexander. Rept. on Maryland Weights and Measures. Balto., 1845. O.
 HILL, H. A. (Author). Memoir of Abbott Lawrence. Boston, 1883. O.
 HOLT, H. & Co. New York. (Publishers). Firdusi. Epic of Kings. Trans. by H. Zimmer. N. Y., 1883.
 Robinson, E. G. Yale Lectures on Preaching. N. Y., 1883.
 Witt, C. Classic Mythology. N. Y., 1883.
 Freeman, E. A. Impressions of the U. S. N. Y., 1883.
 Porter, L. H. Outlines of U. S. Constitutional History. N. Y., 1883.
 Maine, H. S. Early Law and Custom. N. Y., 1883.
 Lacombe, P. Growth of a People. N. Y., 1883.
 Macloskie, G. Elementary Botany. N. Y., 1883.
 Palmer, A. S. Folk Etymology. N. Y., 1883.
 Croffut, W. A. A Midsummer Lark. N. Y., 1883.
 Sergeant, A. Beyond Recall. N. Y., 1883.

- INGHAM, W. A. Reports 2d Geolog. Survey of Pennsylvania. 63 vols, various dates. O.
 JACOB, A. (Author). Die Johns Hopkins Universität. New York, 1881. O.
 JOHNSON, WESLEY. Wyoming Memorial, 100th year.
 KNOX, HON. J. J. Reports of the Comptroller of the Currency, 1881.
 LAWS, J. B. (Author). Rain and Drainage Water at Rothamsted. London, 1882. D.
 MARTIN, PROF. H. N. Martin & Moale. Hand-Book of Vertebrate Dissection, II.
 New York, 1883. D.
 MARYE, G. T., JR. (San Francisco). Proposed Charter for San Francisco. 1883. O.
 MARYLAND HISTORICAL SOCIETY. Johnson, Gen. B. T. The Foundation of Maryland.
 Baltimore, 1883. O.
 MASON, REV. P. H. (Author). Elementary Hebrew Grammar. Cambridge, Eng.,
 1877. O.
 Hebrew Exercise Book. Cambridge, Eng., 1877. O.
 Shemets Davar. Cambridge, Eng., 1880. O.
 MASON, J. J., M. D. (Author). Nervous System of Reptiles. Newport, 1882. F.
 McLANE, HON. R. M. Official Records of the Union and Confederate Armies. 8 vols.;
 and other Public Documents.
 MICHIGAN, STATE OF. Public Documents. 1860-81.
 MILWAUKEE CHAMBER OF COMMERCE. Report, 1882.
 MORRIS, PROF. C. D. Strype. Memorials of Cranmer. Oxford, 1848. O.
 Heylyn. Hist. of Reformation in England. Cambridge, 1849. O.
 MORRIS, PROF. G. S. (Author). Kant's Critique of Pure Reason. Chicago, 1882. D.
 Watson. Schelling's Transcendental Idealism. Chicago, 1882. D.
 NELSON, WILLIAM. Historical Pamphlets.
 NEW ZEALAND COLONIAL MUSEUM. Publications.
 NIMMO, JOSEPH. Publications of the Bureau of Statistics.
 PEABODY INSTITUTE. Catalogue of the Peabody Library, Part I. Balto., 1883. Q.
 PRIBCE, HON. H. B. (Secretary of the Commonwealth of Massachusetts.) Acts and
 Resolves of the Province of Massachusetts Bay. 4 vols. Boston, 1869-82. Q.
 PERKINS, HON. GEO. C. (Governor of California). Official and State Documents.
 PERRY, AMOS. (Librarian, R. I. Historical Society.) Proceedings of the Society.
 PETERS, PROF. C. H. F. Clinton, New York. (Author). Celestial Charts, Nos. 1-20.
 Clinton, New York. F.
 PHILADELPHIA SOCIAL SCIENCE ASSOCIATION. Proceedings and Publications.
 POWELL, J. W. Pamphlets and Addresses, Historical and Sociological.
 ROBB, J. A. (City Register). Financial Reports of Mayor, etc., for 1882. Baltimore,
 1883. O.
 ROBERTS, J. B., M. D. (Author). Clinical History of Peripheric Abscess. Phila.,
 1883. O.
 SCUDDER, S. H. (Author). Pine Moths of Nantucket. Boston, 1883. O.
 SCULL, G. D., Oxford, Eng. (Author). The Evelyns in America. Oxford, 1881. Q.
 SHUFELDT, R. W., M. D. Washington. (Author). Contributions to Anatomy of Birds.
 Washington, 1882. O.
 SMYTH, C. PIAZZI, F. R. S. E., &c. (Author). Madeira Meteorologic. Edinburgh
 1882. O.
 Madeira Spectroscopic. Edinburgh, 1883. O.
 SYLVESTER, PROF. J. J. Byerly. Elements of Differential Calculus. Boston, 1879. O.
 TAYLOR, C. Cambridge University, England. (Author). Geometry of Conics. Cam-
 bridge, 1881. O.
 Sayings of the Jewish Fathers. Cambridge, 1879. O.
 Elementary Geometry of Conics. Cambridge, 1880. D.
 TELLER, HON. H. M. (Secretary, Department of the Interior.) Reports and Docu-
 ments.
 THOMPSON, H. F. Surveys for Pacific Railroad. 13 vols. Q.
 Report on Astronomical Expedition. 2 vols. Q.
 THOMPSON, W. G. (Author). Training-Schools for Nurses. New York, 1883. D.
 THURSTON, PROF. R. H. (Author). Conversion Tables of Weights and Measures. New
 York, 1883. O.

- TRINITY COLLEGE, DUBLIN. (Provost and Senior Fellows). *Codex rescriptus Dublinensis*. (Ancient text of St. Matthew's Gospel.) Dublin, 1880. F.
- Casey. *Sequel to Euclid*. Dublin, 1832. D.
- Leslie. *Essays in Political and Moral Philosophy*. Dublin, 1879. O.
- Tyrrel. *Translations into Greek and Latin Verse*. Dublin, 1832. O.
- Tyrrel. *Acharnians of Aristophanes*. Dublin, 1833. D.
- Tyrrel. *Correspondence of Cicero*. I. Dublin, 1879. O.
- Burnside and Panton. *Equations*. Dublin, 1881. O.
- Maguire. *Parmenides of Plato*. Dublin, 1882. O.
- Haughton. *Lectures on Physical Geography*. Dublin, 1880. O.
- Monck. *Introduction to Logic*. Dublin, 1880. D.
- Graves. *Life of Sir W. R. Hamilton*. I. Dublin, 1882. O.
- Dowden. *Correspondence of Southey*. Dublin, 1881. O.
- Macalister. *Morphology of Vertebrate Animals*. Dublin, 1878. O.
- MacCullagh. *Collected Works*. Dublin, 1880. O.
- Webb. *Goethe's Faust*. Dublin, 1880. O.
- Griffin. *Parabola, Ellipse, and Hyperbola*. Dublin, 1879. D.
- UNIVERSITY OF CHRISTIANIA, NORWAY. *Welsse. Die latein. partikel*. Christiania, 1882. O.
- Daac. *King Christian I*. Christiania, 1879. O.
- Lie. *Classification der Flächen*. Christiania, 1879. Q.
- Stevensen. *Myntfundet*. Christiania, 1881. Q.
- Hiortdahl. *Krystallographische Untersuchungen*. Christiania, 1881. Q.
- Gamborg. *Seddelbanken*. Christiania, 1877. O.
- Hertzberg. *Seddelbanken*. Christiania, 1877. O.
- Klaer. *Seddelbanken*. Christiania, 1877. O.
- Klaer. *Skisfarten*. Christiania, 1877. O.
- Hertzberg. *Kredit*. Christiania, 1877. O.
- Brandt. *Den ældste Norske Process*. Christiania, 1874. O.
- Gamborg. *Byerne og Landet*. Christiania, 1877. O.
- UNIVERSITY OF WÜRZBURG. *Festschrift z. dritten Saecularfeier*. Leipzig, 1882. 2 vols. Q.
- U. S. DEPARTMENT OF STATE. 5 Cases of Books containing about 700 vols. Government Publications.
- U. S. NAVY DEPARTMENT. *Nautical Almanac Office*. (Lieut. E. W. Sturdy, U. S. N., Supt). 28 vols. of American Ephemeris.
- U. S. WAR DEPARTMENT. *Alphabetical Catalogue of Library*. Washington, 1882. Q.
- WASHBURN OBSERVATORY, UNIVERSITY OF WISCONSIN. *Publications I*. Madison, 1882. O.
- WHITEHEAD, WILLIAM A. *New Jersey Archives*.
- WILLIAMS, R. S. *Publications of the Oneida Historical Society. Historical Pamphlets and State Laws*.
- WYOMING HISTORICAL AND GENEALOGICAL SOCIETY. *Proceedings, Addresses, Miscellaneous Pamphlets*.

Besides Public Documents from the various Departments at Washington, and valuable pamphlets from :

Rev. A. J. Perry, Prof. S. H. Gage, Prof. E. C. Pickering, Hon. S. A. Green, Mr. F. C. Whitehouse, Prof. P. Frazer, Mr. H. C. Bolton, Hon. J. H. B. Latrobe, and many other donors.

In response to a special circular from the Historical Department valuable contributions of municipal documents, etc., were received from Mayors Edson (New York), Low (Brooklyn), Whyte and Latrobe (Baltimore), Green and Palmer (Boston), Hayward (Providence), Farley (Cleveland), Romels (Toledo), Harrison (Chicago), Sullivan (St. Louis), Gibson (Kansas City), Bartlett (San Francisco), and Courtenay (Charleston).

W. H. B.

F.

List of Foreign Exchanges.

The following list gives the names of the foreign societies and journals with which a regular exchange of publications is made by the university.

GERMANY AND AUSTRIA.

- Berlin.** Königl. akademie der wissenschaften.
Deutsche chemische gesellschaft.
Jahrbuch über die fortschritte der mathematik.
Journal für reine und angewandte mathematik. (Crelle).
Der naturforscher.
Zeitschrift für deutsches alterthum.
Zeitschrift für völkerpsychologie und sprachwissenschaft.
- Braunschweig.** Archiv für das studium der neueren sprachen.
- Cassel.** Verein für naturkunde.
- Cöthen.** Chemiker zeitung.
- Giessen.** Jahresbericht über die chemie und physik.
- Göttingen.** Königl. gesellschaft der wissenschaften.
Beiträge zur kunde der indogermanischen sprachen.
- Halle.** Beiträge zur geschichte der deutschen sprache.
- Heidelberg.** Naturhistorisch-medizinische verein.
- Heilbronn.** Englische studien.
Literaturblatt f. german. und roman. philologie.
- Jena.** Jenaische zeitschrift für naturwissenschaften.
- Kiel.** University of.
Astronomische nachrichten.
- Leipzig.** K. Sächsische gesellschaft der wissenschaften.
Archiv der mathematik und physik. (Grunert.)
Archiv für lateinische lexikographie.
Jahrbücher für classische philologie.
Liebig's annalen der chemie. (Wöhler, Kopp.)
Literaturblatt für orientalische philologie.
Mathematische annalen. (Clebsch.)
Zeitschrift für mathematik und physik. (Schlömlich.)
Zeitschrift für krystallographie und mineralogie.
Zeitschrift für allgemeine sprachwissenschaft.
Zeitschrift für neu-französische sprache.
Zeitschrift für keilschriftforschung.
Zoologischer anzeiger.
- Marburg.** Jahresbericht u. d. fortschr. d. chemie.
- Munich.** Königl. akademie der wissenschaften.
- Strassburg.** Zeitschrift für physiologische chemie.
- Trieste.** K&A.
- Tübingen.** Jahresbericht für reine chemie.
- Vienna.** K.-k. akademie der wissenschaften.
Ornithologische verein.
K.-k. geologische reichsanstalt.
- Wiesbaden.** Zeitschrift für analytische chemie. (Fresenius.)
- Würzburg.** Medicinische facultät.

FRANCE AND SWITZERLAND.

- Cherbourg.** Société nationale des sciences naturelles et mathématiques.
- Paris.** Institut de France: Académie des sciences.
Bureau des longitudes.

- Paris.** École normale supérieure.
 École polytechnique.
 Observatoire de Paris.
 Société chimique de Paris.
 Société historique.
 Société mathématique de France.
 Annales de chimie et de physique.
 L'astronomie.
 Bulletin des sciences mathématiques et astronomiques.
 Journal Asiatique.
 Journal de mathématiques pures et appliquées.
 Moniteur scientifique.
 Nouvelles annales de mathématique.
 Reforme sociale.
 Revue de chefs d'œuvres.
 Revue internationale de l'enseignement.
 Revue linguistique.
 Revue politique et littéraire.
 Revue scientifique
- Roscoff.** Laboratoire de zoologie expérimentelle.
-
- Bern.** Schweiz. gesellsch. für die gesammten naturwissenschaften.
Zurich. Société helvétique des sciences naturelles.

BELGIUM AND HOLLAND.

- Brussels.** Académie des sciences de Belgique.
 Musée royal d'histoire naturelle.
 Annales du bibliophile.
 Athenæum belge.
- Ghent.** Mathésis.
 Archives de biologie.
- Harlem.** Musée Teyler.
- Leyden.** Nederlandsche dierkundige vereeniging.
 Recueil des travaux chimiques des Pays-Bas.
- Liège.** Société royale des sciences.
- Louvain.** Le musée.

ITALY; SPAIN; PORTUGAL.

- Milan.** Istituto Lombardo di scienze e lettere.
 Annali di matematica pura ed applicata.
- Naples.** Giornale di mathematiche.
 Zoologische station zu Neapel.
- Palermo.** Gazzetta chimica Italiana.
- Rome.** Reale accademia dei lincei.
 Comitato geologico d'Italia.
- Turin.** Reale accademia delle scienze.
 Archives Italiennes de biologie.
 Rivista di chimica medica.
- Venice.** Reale istituto Veneto.
- Coimbra.** Jornal de sciencias mathematicas e astronomicas.
- Lisbon.** Academia real das sciencias.
- Madrid.** Novedades científicas.

GREAT BRITAIN AND IRELAND.

- Cambridge.** Philosophical society.
 Philological society.
- Dublin.** Royal Irish academy.
 Trinity college.

Edinburgh. Royal society.

London. Royal society.

Royal astronomical society.

Royal microscopical society.

Royal institution of Great Britain.

Chemical society.

Mathematical society.

Mineralogical society.

Science and art department, South Kensington.

Society of biblical archaeology.

Society of telegraph engineers.

Society of chemical industry.

Antiquarian magazine.

Brain.

Chemical news.

Journal of conchology.

Journal of education.

Palestine exploration fund.

Scientific roll.

DENMARK, SWEDEN AND NORWAY ; RUSSIA AND FINLAND.

Bergen. Museum.

Copenhagen. Royal academy.

Tidskrift for matematik.

Christiania. Archiv for matematik og naturvidenskab.

University of Christiania, publications.

Norwegische commission der gradmessung.

Stockholm. Acta mathematica.

St. Petersburg. Académie impériale des sciences.

Russian chemical society.

Helsingfors. Société des sciences de la Finlande.

BRITISH INDIA.

Calcutta. Asiatic society of Bengal.

SYRIA.

Beyrout. Mukhtaf.

JAPAN.

Tokio. University, publications of scientific department.

Seismological society of Japan.

AUSTRALIA AND NEW ZEALAND.

Sydney. Royal society of New South Wales.

Adelaide. Royal society of South Australia.

Wellington. Colonial Museum.

New Zealand Institute.

Geological Survey.

MEXICO.

Mexico. Revista científica Mexicana.

Observatorio.

SOUTH AMERICA.

Rio de Janeiro. Observatoire impériale.

Quito. Anales de la universidad.

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This Report covers the Academic year ending September 1, 1883. The Appendix contains some statements of a more recent date.

ISSUED February 16, 1884.

PUBLICATIONS OF THE
JOHNS HOPKINS UNIVERSITY
BALTIMORE

- I. **American Journal of Mathematics.**
J. J. SYLVESTER, Editor. Quarterly. 4to. Volume VI in progress.
\$5 per volume.
- II. **American Chemical Journal.**
I. REMSEN, Editor. Bi-monthly. 8vo. Volume VI in progress. \$3 per volume.
- III. **American Journal of Philology.**
B. L. GILDERSLEEVE, Editor. Quarterly. 8vo. Volume IV in progress.
\$3 per volume.
- IV. **Studies from the Biological Laboratory.**
Including the Chesapeake Zoölogical Laboratory. H. N. MARTIN, Editor,
and W. K. BROOKS, Associate Editor. 8vo. Volume III in progress.
\$5 per volume.
- V. **Studies in Historical and Political Science.**
H. B. ADAMS, Editor. Monthly. 8vo. Volume II in progress. \$3 per volume.
- VI. **Contributions to Logic.**
C. S. PEIRCE, Editor. Little, Brown & Co., Boston, Publishers.
- VII. **Johns Hopkins University Circulars.**
Containing reports of scientific and literary work in progress in Baltimore.
4to. Vol. I, \$5; Vol. II, \$2; Vol. III in progress. \$1 per year.
- VIII. **Annual Report.**
Presented by the President to the Board of Trustees, reviewing the operations of the University during the past academic year.
- IX. **Annual Register.**
Giving the list of officers and students, and stating the regulations, etc., of the University. *Published at the close of the Academic year.*
- X. **The Journal of Physiology.**
Edited by Professor MICHAEL FOSTER, of Cambridge, Eng., and published with the aid of the Johns Hopkins University. Volume IV in progress.
8vo. \$5 per volume.

Communications in respect to exchanges and remittances may be sent to the Johns Hopkins University (Publication Agency), Baltimore, Maryland.

The **UNIVERSITY REGISTER** for the 'current academic year, 1883-84, and the **PROGRAMME** for the next year, 1884-85, will be issued in June, 1884.

NINTH ANNUAL REPORT

OF THE PRESIDENT OF THE

JOHNS HOPKINS UNIVERSITY

Baltimore, Maryland

1884

ACADEMIC STAFF, 1884-85.

Daniel C. Gilman, LL. D.,	<i>President of the University.</i>
J. J. Sylvester, F.R.S., D.C.L.,	<i>Professor (Emeritus) of Mathematics.</i>
Basil L. Gildersleeve, Ph. D., LL. D.,	<i>Professor of Greek.</i>
G. Stanley Hall, Ph. D.,	<i>Professor of Psychology and Pedagogics.</i>
Paul Haupt, Ph. D.,	<i>Professor of the Shemitic Languages.</i>
H. Newell Martin, Dr. Sc., A. M.,	<i>Professor of Biology.</i>
Charles D. Morris, A. M.,	<i>Collegiate Professor of Latin and Greek.</i>
Simon Newcomb, Ph. D., LL. D.,	<i>Professor of Mathematics and Astronomy.</i>
Ira Remsen, M. D., Ph. D.,	<i>Professor of Chemistry.</i>
Henry A. Rowland, Ph. D.,	<i>Professor of Physics.</i>
William H. Welch, M. D.,	<i>Professor of Pathology.</i>
John S. Billings, M. D.,	<i>Lecturer on Hygiene.</i>
Hiram Corson, A. M., LL. D.,* (Cornell Univ.)	<i>Lecturer on English Literature.</i>
Edmund Gosse,* (Univ. Camb.)	<i>Lecturer on English Literature.</i>
George S. Morris, A. M., Ph. D.,	<i>Lecturer on the History of Philosophy.</i>
Léonce Rabillon, Bach. ès Lett.,	<i>Lecturer on French Literature.</i>
Sir William Thomson, LL.D.,* (Univ. Glasg.)	<i>Lecturer on Molecular Dynamics.</i>
Herbert B. Adams, Ph. D.,	<i>Associate Professor of History.</i>
Maurice Bloomfield, Ph. D.,	<i>Associate Professor of Sanskrit.</i>
William K. Brooks, Ph. D.,	<i>Associate Professor of Morphology.</i>
Thomas Craig, Ph. D.,	<i>Associate Professor of Applied Mathematics.</i>
A. Marshall Elliott, A. M.,	<i>Associate Professor of the Romance Languages.</i>
J. Rendel Harris, A. M.,	<i>Assoc. Prof. of New Test. Greek and Palaeography.</i>
Harmon N. Morse, Ph. D.,	<i>Associate Professor of Chemistry.</i>
William E. Story, Ph. D.,	<i>Associate Professor of Mathematics.</i>
Minton Warren, Ph. D.,	<i>Associate Professor of Latin.</i>
William Hand Browne, M. D.,	<i>Librarian and Associate in English.</i>
Charles F. Raddatz,	<i>Examiner in German.</i>
William T. Councilman, M. D.,	<i>Associate in Pathology.</i>
Richard T. Ely, Ph. D.,	<i>Associate in Political Economy.</i>
Fabian Franklin, Ph. D.,	<i>Associate in Mathematics.</i>
Edward M. Hartwell, M. D., Ph. D.,	<i>Associate in Physical Training.</i>
J. Franklin Jameson, Ph. D.,	<i>Associate in History.</i>
Arthur L. Kimball, Ph. D.,	<i>Associate in Physics.</i>
Philip R. Uhler,	<i>Associate in Natural History.</i>
George H. Williams, Ph. D.,	<i>Associate in Mineralogy.</i>
Henry Wood, Ph. D.,	<i>Associate in German.</i>
George Hempl, A. B.,	<i>Instructor in German.</i>
Hugh Newell,	<i>Instructor in Drawing.</i>
Edward H. Spieker, Ph. D.,	<i>Instructor in Latin and Greek.</i>
Henry A. Todd, A. B.,	<i>Instructor in Romance Languages.</i>
Charles L. Woodworth, Jr.,	<i>Instructor in Elocution.</i>
William H. Howell, Ph. D.,	<i>Assistant in Biology.</i>
Edward H. Keiser, Ph. D.,	<i>Assistant in Chemistry.</i>
Charles A. Perkins, Ph. D.,	<i>Assistant in Physics.</i>
Otto Luggier,	<i>Curator of the Biological Museum.</i>

* For the current year.

NINTH ANNUAL REPORT

OF THE PRESIDENT OF THE

Johns Hopkins University

Baltimore, Maryland

1884

BALTIMORE
PRINTED BY JOHN MURPHY & Co.
182 BALTIMORE STREET
1884

TRUSTEES.

1883-84.

President:

GEORGE W. DOBBIN.

Treasurer:

FRANCIS WHITE.

Secretary:

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JOSEPH P. ELLIOTT,	ALAN P. SMITH,
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CHARLES J. M. GWINN,	JAMES CAREY THOMAS,
LEWIS N. HOPKINS,	FRANCIS WHITE.

COMMITTEES.

1883-84.

Executive Committee:

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JAMES CAREY THOMAS,	FRANCIS WHITE,
CHARLES J. M. GWINN,	GEORGE W. DOBBIN, <i>ex officio</i> .

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FRANCIS WHITE,	GEORGE W. DOBBIN, <i>ex officio</i> .

Building Committee:

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FRANCIS T. KING,	JAMES CAREY THOMAS,
GEORGE W. DOBBIN, <i>ex officio</i> .	

Committee in Charge of the Clifton Grounds:

LEWIS N. HOPKINS,	JOHN W. GARRETT,
JOSEPH P. ELLIOTT,	GEORGE W. DOBBIN, <i>ex officio</i> .

NINTH ANNUAL REPORT.

To the Trustees of the Johns Hopkins University:

I have the honor of submitting to you, and through you to the public, the ninth annual report of the Johns Hopkins University, for the academic year which closed on the first of September, 1884, the eighth year of instruction.

From the detailed statements which will be given on the subsequent pages, it will be obvious to all who are watching the growth of this foundation that the range of instruction is constantly widening, that the facilities for study are increasing, and that the opportunities here provided are appreciated by a company of enthusiastic students which constantly grows larger.

The various publications which are encouraged by appropriations from the funds of the university have appeared as promised, without any important changes in their plans. The "Circulars" have been made more than ever the repository of important abstracts, notes and brief communications furnished by the principal teachers and their advanced scholars.

NUMERICAL STATEMENTS.

The academic staff included during the year forty-nine teachers, six of whom were non-resident lecturers. The number of students enrolled during the year was two hundred and forty-nine, of whom one hundred and twenty-three were residents of Maryland, and one hundred and eleven came here from twenty-nine other States of the Union, and fifteen from foreign countries. Among the students were one hundred and fifty-nine already graduated, coming from seventy-six colleges and universities; there were fifty-three matriculates (or candidates for the degree of Bachelor of Arts); and there were thirty-seven admitted as special students, to pursue courses of study for which they seemed fitted, without reference to possible graduation. The attendance upon the public lectures (not including those in French) averaged one hundred and twenty-two.

Twenty-three young men have been admitted to the degree of Bachelor of Arts, and fifteen have been promoted to that of Doctor of Philosophy—making in all thirty-eight graduates. Since degrees were first conferred, in 1878, seventy-nine persons have attained the Baccalaureate degree, and fifty-four have been promoted to the degree of Doctor of Philosophy.

The following table indicates the enrollment of students in each year since the university was opened in the autumn of 1876:

	Graduates, (incl. Fellows.)	Matriculates.	Non- Matriculates.	Total Enrolled.	Average attend- ance at Public Lectures.
1876-77	54	12	23	89	60
1877-78	58	24	22	104	84
1878-79	63	25	35	123	96
1879-80	79	32	48	159	113
1880-81	102	37	37	176	186
1881-82	99	45	31	175	137
1882-83	125	49	30	204	148
1883-84	159	53	37	249	122

The attendance upon some of the principal courses during the last six years has been as follows :

	1878-79.	1879-80.	1880-81.	1881-82.	1882-83.	1883-84.
Mathematics, .	38	31	31	33	35	37
Physics, . . .	32	38	35	42	50	56
Chemistry, . .	39	46	40	44	49	51
Biology, . . .	26	32	25	32	30	47
Greek,	40	36	31	33	44	41
Latin,	27	40	40	39	41	48
Sanskrit, . . .	*	*	*	6	8	10
Shemitic Lan- guages,	*	*	*	*	*	13
German,	55	60	55	47	50	63
French, Italian, etc.,	18	39	33	26	31	31
English,	*	19	29	22	45	50
History and Poli- tical Science, .	19	33	40	40	64	88
Logic,	6	16	13	9	14	17
Philosophy, Eth- ics, etc., . . .	6	12	14	22	47	28

* Not recorded.

During eight years, six hundred and forty-eight individuals have been here enrolled as students, of whom three hundred and twenty-nine have come from Maryland, (including two hundred and sixty-three from Baltimore), and three hundred and nineteen from forty-two other states and countries. Of this number three hundred and ninety-five persons pursued courses as graduate students, and two hundred and fifty-three as collegiate students.

COMPLETION OF THE NEW LABORATORIES.

The new laboratories which were referred to in the last report, one for chemistry and one for biology, have proved entirely satisfactory to those who are most interested in their purposes. The chemical laboratory, as already stated, was formally opened in May, 1883; the biological laboratory was not completely ready for use until the autumn of the same year. On the second of January many members of the medical profession, the friends of the students, and others were invited to visit the building and to hear an address which was made by Dr. Martin on "Modern Physiological Laboratories; what they are and why they are."* Diagrams showing the plans of these two

* Printed in *Science*, for January 18, 25, 1884, and in the Johns Hopkins University Circulars, No. 29.

buildings and full descriptions, will be found on a later page.

By the transfer of the biologists to a separate edifice, ample space was provided for the present wants of students in history and political economy. Adjacent to a large room in which the Bluntschli library and other kindred books were placed, apartments were allotted to class instruction and to the studies of the professors. Other advantageous changes in the buildings have also been made. The university still needs a special building for its physical laboratory and this will probably be constructed at an early day.

A gymnasium has also been built and fitted up with a good selection from the Sargent apparatus. Bath-rooms and a ball-court are adjacent to the principal room. This addition to the attractions of the university life is greatly appreciated by the students, who have long been asking for some such means of recreation and physical training.

CHANGES IN THE ACADEMIC STAFF.

At the beginning of the session, Professor Sylvester, who had been connected with the university since its opening in 1876, expressed a desire to be released from further service. Accordingly, in December, 1883, his connection with this institution was formally closed,—though his name will

henceforward appear on our roll as Professor Emeritus,—and his services will hereafter be given to the University of Oxford, where he has received the appointment of Savilian professor of geometry. Resolutions of respect were adopted by the Trustees and by the Faculty on his departure; a social assembly was held in Hopkins Hall to wish him farewell; and a medal in gold was struck and presented to him by colleagues, pupils and friends, in commemoration of his seven years' residence in Baltimore. In leaving, he expressed great regard for his associates and scholars, and his appreciation of the opportunities which had been opened to him in the professorship of mathematics at the Johns Hopkins University.

In September last Dr. Paul Haupt, Professor in the University of Göttingen, came among us as Professor of the Shemitic languages, and at once began to give instruction in Hebrew and Arabic and the cognate languages, to a company of well-trained and enthusiastic students, more numerous than we had reason to expect. He had also a class in Assyrian and Sumero-Akkadian. The increasing importance of these studies, and the interest attaching to them from every point of view—biblical, historical, and philological—are more and more obvious. As these pages are preparing for the press an announcement is made that, at the cost of Miss Wolfe, of New York, and under the guidance

of Dr. W. H. Ward, of that city, an expedition will proceed, before winter, from this country to the valley of the Euphrates for the purpose of exploration.

Instruction in Logic, Psychology, Ethics, and the History of Philosophy, has hitherto been given by three lecturers—no one of whom was recognized as the head of the department, and no one of whom devoted himself exclusively to his work in this university. The objections to this arrangement were apparent to all who were interested in these subjects, and when the infelicity was distinctly brought to the attention of the Trustees by one of the lecturers, the decision was reached to appoint a professor in the group of philosophical subjects, and to allow the lectureships to terminate at the end of the period for which they had severally been arranged.

The next step of the Trustees was to make choice of Dr. G. Stanley Hall, late lecturer in Harvard and Williams Colleges, and also in this university, as Professor of Psychology and Pedagogics. He accepted the invitation, and will hereafter reside among us. Dr. Hall is a graduate of Williams College, who spent several years in study abroad, and has been an influential writer, lecturer, and investigator in the subjects to which he is devoted. ✓

As the construction of the Johns Hopkins Hospital approaches completion, the university is devoting much thought to the organization of its Faculty of Medicine. A study of the problem, consultation with eminent physicians at home and abroad, and an examination of other institutions, led long ago to the conclusion that a Professorship of Pathology should be among the earliest to be instituted. Chemistry and Biology, including morphology, embryology, and physiology, were already taught in the philosophical faculty. Pathology and Therapeutics were the scientific chairs which seemed to be next called for, as their instructions would be likely to require experimental laboratories, distinct from the Hospital and from the other university working rooms. After much inquiry, at home and abroad, the Trustees made choice of Dr. William H. Welch, of New York, to be Professor of Pathology. He is a graduate of Yale College, and of the College of Physicians and Surgeons, New York, who pursued his studies abroad, and afterwards became Professor in the Bellevue Hospital Medical College of New York. In forming their opinion of his qualifications for this responsible post, the Trustees had the benefit of many counsellors in the medical profession, among whom it may be proper to name Professor Cohnheim, of Leipsic, with whom Dr. Welch had

been a student.* Dr. Welch will spend a considerable portion, if not all, of the next year, in Europe, where he will make such purchases and pursue such inquiries as will enable him to be most useful when he returns to Baltimore. As an Associate in this department, Dr. Welch recommended, and the Trustees concurred in, the appointment of Dr. William T. Councilman, of Baltimore, who has been for several years connected with our biological laboratory as a student, an investigator, and a lecturer.

Dr. C. S. Hastings, Associate Professor of Physics, has accepted an invitation to become Professor of Physics in the Sheffield Scientific School of Yale College. During his residence in Baltimore he has devoted much attention to a study of the telescope, and has worked out a mathematical theory of the lens, which promises to be of great value in the manufacture of object glasses. He has also made a lens in accordance with this theory, which has proved to be very satisfactory under all the tests to which it has been submitted, and which, if he had remained in Baltimore, it was our hope to secure for the use of this university. He has also given much attention to the study of the sun's corona, both before and subsequent to the observations

*The sad intelligence has just been received of the death of Dr. Cohnheim, August 15, 1884, at the age of 45 years.

which he made on the Caroline Island, during the solar eclipse of May 6, 1883. He carries with him to his new position the good wishes of all his colleagues in Baltimore.*

The place made vacant by his withdrawal has been offered to Mr. A. L. Kimball, Ph. D., who received his first degree at Princeton in 1881, and has since been resident among us as a Fellow, and as an assistant to Professor Rowland in the investigation which he is making for the government with respect to the unit of electrical resistance.

The ability shown by Mr. J. Rendel Harris, (late a Fellow and Lecturer in Clare College, of the University of Cambridge), in the textual study of the New Testament, and other early Christian writings, and the acuteness which he has shown in palaeographic study, has led the university to encourage him in the prosecution of such inquiries, and to designate him Associate Professor of New Testament Greek and Palaeography. He returned to Europe last June, where he proposed to devote a considerable period of time to the study of ancient manuscripts and to consultation with those who are expert in reading them. He will resume

*For an account of his theory of the lens, see the Johns Hopkins University Circulars No. 19; his report on the observations made in the expedition to the Caroline Island, has been submitted to the Government and will soon be printed.

his work among us early in the coming academic year.

There have been other minor changes in the staff, of which the most important are these: Mr. A. M. Elliott has been designated Associate Professor of the Romance Languages; Dr. Henry Wood has been transferred, by his own wish, from the chair of English to that of German. Mr. H. F. Reid has given up the post of assistant in Physics in order to go to Europe, and the place is filled by the appointment of Mr. C. A. Perkins, Ph. D. Dr. A. Emerson has been designated an assistant in Classical Archæology for the year 1884-5.

PUBLIC LECTURES.

In the public lectures during the year special attention was given for a considerable period to the subject of archæology. The course began with a lecture from Dr. Charles Waldstein, of the University of Cambridge, England, whose subject was the Influence of Athletic Games on Greek Art. He was followed by Mr. J. T. Clarke, of Boston, who has conducted the researches of the Archæological Institute of America at Assos, in Asia Minor, and who added to a plea for archæology, an illustrated narrative of the expedition of which he had been in charge. Mr. W. J. Stillman, formerly United States Consul in Crete, lectured after-

wards on Pre-historic Research in the Classical Field, on the State of Research in Greece, and on the Relations of Art to Archæology. Dr. Alfred Emerson, a Fellow in Greek of this university, gave six lectures on Olympia, in which he discussed the results obtained by the German expedition under Professor E. Curtius in their relation to what is otherwise known of the history, the architecture, and the life of Olympia. The course was concluded with a lecture from Professor Gildersleeve on the Relations of Literary and Plastic Art.*

Under the influence of this impulse, a university Archæological Society was formed early in the year, which at the close was made the Baltimore branch of the Archæological Institute of America. Frequent meetings have been held, at which papers have been presented by the resident members, and addresses have been made by Major Powell, of the U. S. Geological Survey, Mr. Clarke, Mr. Stillman, and others. For a moderate consideration, the university has obtained from the family of the late Mr. Mendez Cohen, of Baltimore, the remarkable collection of Egyptian antiquities which he brought together many years ago, and this will become, it is hoped, the nucleus of a museum of archæology.

* Reports of these lectures are given in the Johns Hopkins University Circulars, Nos. 29 and 32, iii, p. 62 and p. 132.

A company of persons interested in the study of Christian art, under the leadership of Dr. A. L. Frothingham, Jr., have met several times during the spring in the Peabody Institute, for the purpose of studying, by photographs and engravings and valuable monographs belonging to that library, Italian art prior to the sixteenth century.*

The visits to the United States, of Professor Bryce, of Oxford, and Professor von Holst, of Freiburg, gave the university opportunity to secure from them once more brief courses of lectures. Mr. Bryce, whose previous visit was in 1881, took for his theme, by request, the study of Roman Law, and Mr. von Holst, who had previously lectured in 1879, now discussed the relation of History and Politics. Dr. J. S. Billings, U. S. A., the medical adviser of the Hospital Trustees, delivered a course of lectures on Municipal Hygiene, with special reference to the condition of Baltimore. Some of his most important remarks were subsequently printed in the "Circulars."†

Lectures were also given by Professor G. S. Morris, whose special subject was the Ethics of Social Relations, by Professor G. Stanley Hall on Pedagogics, and by Dr. Josiah Royce, formerly

* For a sketch of these meetings, see the Johns Hopkins University Circulars, No. 32, iii, p. 138.

† See Johns Hopkins University Circulars, No. 30, iii, p. 81.

one of our staff of Fellows, on the Religious Aspect of Philosophy. In literature, three courses of public lectures were given. Professor Corson, of Cornell University, took for his theme the Poetry and Drama of the Restoration Period. So many persons showed a desire to hear him that Hopkins Hall was quite inadequate for the audience. Under these circumstances, the Trustees of the Peabody Institute, to whom the university is indebted for many favors, consented to allow the course to be given as a Peabody Class Course in one of their large lecture rooms. Later in the year Dr. Henry Wood gave a course of lectures on English Literature in the period from 1500 to 1580. Mons. Rabillon has continued, as heretofore, to lecture weekly in the French language on subjects in French literature. Mr. J. Rendel Harris gave a course of public lectures on Textual Criticism, and after the publication of the "Teachings of the Apostles," made that interesting treatise the subject of three lectures which were attended by clergymen of all denominations. During the first part of the session Professor Trelease, of the University of Wisconsin, was engaged among us as a teacher of Botany, and he also gave four public lectures on the Fertilization of Flowers. The average attendance upon all these courses of lectures is less than it has been during any of the three years previous. The novelty is past, and the audience is now chiefly

made up of those who take a serious interest in the subjects brought forward. Many are discouraged from coming because of the inadequate ventilation of the hall in winter, when full. Nevertheless, the plan which we have followed here during the last eight years of inviting to Baltimore as university lecturers distinguished scholars in various departments of learning, and whose permanent services we could not hope to engage, is productive of great good. Members of our own Faculty have also the opportunity, which is certainly at times most desirable, of coming before general audiences. To many of the residents of Baltimore, the lectures in Hopkins Hall are a constant source of instruction and pleasure, and it is said that in a few instances the opportunity of hearing these lectures has determined the winter residence of families and individuals.

COURSES OF INSTRUCTION.

I now proceed to the indication of the systematic instruction which has been given during the year in each of the subjects represented among us. The statements which immediately follow are generally, though not always, given in the form received from the principal instructors.

Classes have been taught during the year in English, Anglo-Saxon, German, French, Italian,

Spanish, Latin, Greek, Sanskrit, Hebrew, Arabic, and Assyrian; in various branches of Mathematics, including algebra of multiple quantity—invariants, non-Euclidean geometry, mathematical astronomy, higher plane curves, and conic sections—theoretical dynamics, elliptic functions, theory of functions, partial differential equations, theory of elasticity, and spherical harmonics—determinants, total differential equations, solid analytic geometry, the calculus and probabilities;—in Physics, including thermodynamics, heat conduction, physical optics, mechanics, mathematical theory of sound, theory of elasticity, mathematical astronomy, and general physics;—in Chemistry, mineralogy, geology;—in Biology, including animal and vegetable physiology and morphology;—in ancient and modern History, political economy, and international law;—and in logic, ethics, psychology, the history of philosophy, and pedagogics.

REPORTS ON THE STUDIES OF THE YEAR.

MATHEMATICS.

The following courses of lectures, etc., have been given during the year.

Professor Sylvester :

Algebra of Multiple Quantity. *Twice weekly, till the Christmas recess.*

Dr. Story :

Theory of Invariants. *Three times weekly, first half-year.*

Non-Euclidean Geometry. *Twice weekly, second half-year.*

Mathematical Astronomy. *Three times weekly, first half-year ; twice weekly, second half-year.*

Higher Plane Curves. *Twice weekly, through the year.*

Conic Sections. *Twice weekly, through the year.*

Dr. Craig :

Theoretical Dynamics. *Twice weekly, first half-year.*
 Mathematical Theory of Sound. *Three times weekly, first half-year.*
 Elliptic Functions. *Three times weekly, first half-year.*
 Theory of Functions. *Three times weekly, second half-year.*
 Partial Differential Equations. *Twice weekly, second half-year.*
 Theory of Elasticity. *Twice weekly, second half-year.*
 Spherical Harmonics and Lamé's Functions. *Three times weekly, second half-year.*

Dr. Franklin :

Mechanics. *Three times weekly, through the year.*
 Total Differential Equations. *Twice weekly, through the year.*
 Determinants and Theory of Equations. *Three times weekly, first half-year.*
 Solid Analytic Geometry. *Three times weekly, second half-year.*
 Differential and Integral Calculus. *Three times weekly, through the year.*

Mr. C. S. Peirce :

Probabilities. *Twice weekly, second half-year.*

PHYSICS.

The rooms devoted to the Physical Laboratory have been open daily for the prosecution of advanced study and research, under the direction of Professor Rowland and Dr. Hastings.

Lectures have been given by Professor Rowland on Thermodynamics, Heat Conduction, and Physical Optics, four times weekly through the year.

The work of a part of the students has been guided by Dr. Hastings. The major course has included lectures, weekly through the year, and daily work in the laboratory, especially on Wednesdays. The minor course in General Physics has included instruction daily through the year in Elementary Mechanics, Acoustics, Heat, Magnetism, Electricity, and Light, and a weekly exercise in the laboratory under Dr. Hastings and Mr. Reid.

During the year original investigations in the following subjects have been carried on :

On the photography of the spectrum by the concave grating.
 On the variation of the magnetic permeability with change of temperature.
 On the distribution of heat in the solar spectrum.
 On the determination of the B.A unit of electrical resistance in absolute measure.
 On the determination of the specific resistance of mercury.

Experiments have been carried on, under the direction of Professor Rowland, by aid of an appropriation from the government of the United States, to assist in establishing an international unit of electrical resistance.

Advanced students have also taken part in weekly meetings, for the reading and discussion of the current physical journals.

CHEMISTRY.

Advanced students have been engaged daily in the laboratory in prosecuting such work as seemed best adapted to the purposes of each. Those who have completed the full courses in General Chemistry, including from two to three years' work in qualitative and quantitative analysis and about a year's work in making difficult and instructive preparations, were encouraged to undertake the solution of original problems.

The following investigations have been completed during the year. Others are in progress.

A contribution to the history of active oxygen.

The action of heat on ethylene.

On the chemical conduct of the sulphinide obtained by oxidizing α -naphthalene-sulphamide.

The effect of light on fermentation.

The relative stability of halogen derivatives of carbon compounds.

The results of these investigations have either been already published or will soon appear in the *American Chemical Journal*. Some of them have been read before the Johns Hopkins Scientific Association at its regular meetings.

The Fellows and other advanced students have met the instructors twice a week during the year for the purpose of keeping abreast of the current chemical literature. All the important journals have been carefully read, and full reports of the various articles have been made.

These students have been often called upon to treat important chemical questions in a broad way, going to the original sources and presenting the results in a complete form. In most cases the topics so investigated have been connected with the experimental work going on at the time; but other questions also have been elaborated in this way which bore less directly on the

current studies. In several cases carefully written reports of the results obtained have been prepared. The excellent library of chemical books and journals which is accessible to the students in the laboratory, at all reasonable hours, has greatly facilitated the execution of this very desirable literary work.

At the beginning of the year subjects were assigned to the Fellows and others for the preparation of lectures on various chemical topics treated historically; and sixteen such lectures were the result. These were prepared from a careful study of the original articles in the journals, and were not borrowed from books on the history of chemistry. Full abstracts of these lectures, furnished with complete references to the articles consulted, are to be prepared and preserved in the chemical library. The lectures given were as follows:

- Two by Mr. D. T. Day on "The History of the Halogens";
- Two by Mr. H. N. Stokes on "The History of Oxygen";
- Two by Mr. E. H. Keiser on "The Chemistry of Iron Historically Considered";
- Two by Dr. J. R. Duggan on "The History of the Azo- and Diazo-Compounds";
- One by Dr. G. H. Williams on "The Relation between Crystalline Form and Chemical Constitution";
- One by Mr. A. G. Palmer on "The History of Benzene";
- One by Mr. H. W. Hillyer on "Stas's Work on Atomic Weights";
- One by Mr. J. E. Talmage on "The History of the Alkali Metals";
- Two by Dr. Morse on "The History of Phosphorus";
- Two by Professor Remsen on "The Basicity of Acids."

In addition, the work of the year has consisted of the courses below mentioned:

Laboratory Work for undergraduates through the entire year, conducted by Professor Remsen and Dr. Morse.

Lectures by Professor Remsen:

General Chemistry (Non-Metals), *five times weekly, first half-year.*

Chemistry of the Compounds of Carbon, *five times weekly, second half-year.*

Courses by Dr. Morse:

Analytical Chemistry, *four times weekly, first half-year.*

General Chemistry (Non-Metals), *five times weekly, second half-year.*

Courses by Dr. Williams:

Practical exercises in Mineralogy and Petrography, through the entire year.

Mineralogy, *three times weekly, first half-year.*

Geology, *three times weekly, second half-year.*

BIOLOGY.

The Biological Laboratory has been open for eight hours daily during the year, for the prosecution of advanced study and research and for courses of practical instruction in connection with classes.

During the year original investigations, the results of which either have been or soon will be published, have been made in the following subjects:

The nature of the process of the coagulation of blood. The chemical composition of the blood of the Terrapin. The influence of various salts and other substances on the contraction of the arterioles. The suction-pump action of the heart. The influence of sudden variations of arterial pressure on the rhythm of the heart. The action of carbolic acid on the heart and its antagonism by atropin. The influence of convallarin and convallamarin on the heart. The anatomy of Nemertians. The development and metamorphosis of various insects. The development and histology of *Salpa*. The histology of *Amiurus*.

In connection with the regular class instruction, first year students thoroughly studied a number of typical fungi, green plants, and animals; the skeletons of about twenty selected vertebrates; and the development of the chick in the egg. In the spring there were a few practical lessons in the elements of Systematic and Descriptive Botany.

Second year students worked at the histology of the tissues and organs of the higher vertebrata (especially man); the physiological properties and functions of the tissues and organs; the physiology of digestion; the chemistry of bile, urine, etc. The stock of physiological apparatus belonging to the University being unusually large, and including several duplicates of all the more frequently used instruments, each student in the class of Animal Physiology had the opportunity and was required to perform for himself all the really fundamental physiological experiments, save such as required some special skill or the use of very delicate apparatus; these were demonstrated to the class. The cat was also thoroughly dissected by the second year students.

A course of twenty-three advanced lectures was given as follows:

Four by Professor Martin on "The Causes of Chemical Degradation in the Animal Body."

Four by Mr. W. H. Howell on "The Consumption of Matter by the Animal Body under various conditions."

Two by Mr. F. S. Lee on "The Formation of Fat in the Animal Body."

Four by Mr. L. T. Stevens on "The Relative Value of Various Food-stuffs."

One by Mr. H. F. Nachtrieb on "The Physiology of Hunger and Thirst."

Three by Mr. Otto Lugger on "The Metamorphosis of Insects."

Two by Mr. H. L. Osborn on "The Embryology of Insects."

Three by Mr. H. W. Conn on "The Relationship between Vertebrates and Invertebrates."

Dr. W. K. Brooks gave a course of about thirty-five lectures on the Morphology of the Crustacea.

Professor W. Trelease, of the University of Wisconsin, delivered in January fourteen lectures on "Vegetable Physiology." He also delivered in Hopkins Hall four lectures on "The Fertilization of Flowers."

Most of the advanced work, however, was carried on individually, and not in class; each worker taking up some special topic for study under the immediate direction of some one of the instructors. In addition to the original researches already enumerated, certain graduate students have in this manner carried on advanced study in various directions.

Students engaged in this kind of study (which forms a stepping-stone between class-work and original research), are usually given some important original article, and shown how to repeat and verify for themselves (and criticise, if necessary) the experiments and results described in it. By studying and repeating the original work of others they learn the methods of biological investigation, and are thus trained to plan and carry out researches themselves. In connection with this work, students are also taught how to hunt up and utilize the bibliography of a subject.

Courses of lectures for undergraduates were given as follows:

Osteology, twice weekly, through the year.

Mammalian Anatomy, twice weekly, until Christmas.

Animal Physiology and Histology, three times weekly, through the year.

General Biology, three times weekly, until the middle of April.

Embryology of the Chick, three times weekly, from the middle of April until the close of the session.

Plant Analysis, twice weekly, in May.

The seaside Zoölogical Laboratory for the study of forms of marine life has been open during the season of 1884 at Beaufort, N. C., under the direction of Dr. Brooks and Dr. Conn.

Researches were carried on at the Marine Laboratory upon the following subjects, among others :

The development of *Thalassema*. The anatomy and development of Echinoderms and Nemertians. The anatomy and development of *Balanoglossus*. The embryology and anatomy of *Limulus*, and of Gasteropods. The origin and significance of larval forms. The systematic zoölogy, anatomy and embryology of Hydroids. The histology of the eggs of Teleosts. The physiological influence of digitaline and other poisons. The zoölogy and metamorphosis of Crabs.

Articles by various members of the biological department have also been published in the *University Circulars*, *Studies from the Biological Laboratory*, in the *Journal of Physiology*, and in the *Zoölogischer Anzeiger*. Abstracts of two researches have been printed in the Proceedings of the Royal Society of London, and will appear in full in the "Philosophical Transactions."

The report of the Oyster Commission of the State of Maryland, prepared by Dr. W. K. Brooks, Chairman of the Commission, and embodying the results of his prolonged investigations at the Marine Laboratory upon the propagation of the American Oyster, was issued in February.

ANCIENT AND MODERN LANGUAGES.

Greek.

Under the direction of Professor Gildersleeve the advanced students of Greek have been organized into a Greek Seminary. According to the plan of the seminary the work of each year is concentrated on some leading author or some special department of literature. During the past year the work has been in the Greek historians.

In the seminary proper, which met twice a week during the academic year, select portions of Thukydides were interpreted in turn by the different members of the seminary, with lectures and illustrative papers by the Director and the students.

Among the subjects treated may be mentioned: The composition of the different parts of the history of Thukydides, the principles that regulate the introduction of the Thukydidean speeches, use of the passive and middle in Thukydides, Thukydidean compounds, use of *θέρος* and *χειμών* in Thukydides, oracles in Herodotos, conditional sentences in Herodotos, the tract de Republica Atheniensium.

The work of the seminary was supplemented by the lectures of the Director on Greek Historiography, illustrated by readings and by an analysis of the treatises of Dionysios of Halikarnassos on the style of Thukydidēs.

Besides the seminary course proper, Professor Gildersleeve delivered twenty-five lectures on the Theory of the Cases, conducted twenty-two exercises in translating at dictation from Greek into English, and English into Greek, and gave a course of fifteen lectures on Lucian.

Mr. Harris conducted a class-course in New Testament Greek, twice weekly, through the year, and gave two courses, one, of six lectures, on some New Methods of Textual Criticism, and the other, of three lectures on the newly published tract entitled "The Teachings of the Apostles."

Dr. Emerson conducted two classes in Pausanias and Greek Inscriptions, each meeting weekly during the second half-year, and a class in Greek Classical Antiquities, meeting twice weekly during the first half-year.

A public course on Classical Archæology, comprising fifteen lectures, was given during the year. The course began with a lecture by Dr. Charles Waldstein, four lectures were given by Mr. J. T. Clarke, three by Mr. W. J. Stillman, six by Dr. A. Emerson, and a closing lecture by Professor Gildersleeve.

Additional courses were conducted during the year, by :

Professor C. D. Morris, in

Thukydidēs, bk. VII, *four times weekly, first half-year.*

Sophokles, *Philoktetes*; Aristophanes, *Ranae*, *four times weekly, second half-year.*

(This class has also read at sight the Apology and Crito of Plato and about one-half of the Antigone of Sophokles).

Homer, *Iliad*, *once weekly, through the year.*

Dr. Spieker, in

Lysias, *four times weekly, first half-year.*

Homer, *Odyssey*, IX-XII; Euripides, *Alcestis*, *four times weekly, second half-year.*

Classes in Greek Prose Composition were also conducted by each of the instructors in connection with the courses above named.

Students have privately read for examination the following books :

Aeschylus, *Persae* (4).

Aristophanes, *Plutus* (1).

Demosthenes, in *Timocratem* (6).
 Euripides, *Hippolytus* (4).
 Herodotus, (Merry's Selections) (7).
 Sophocles, *Electra* (1).
 Xenophon, *Hellenica*, I, II, (7).

Latin.

The Latin Seminary under the direction of Dr. Warren, held two sessions a week throughout the year, the author selected for special study being Terence.

The plays of Terence were analyzed by the members of the seminary in turn, and a part of the *Phormio* and a very considerable portion of the *Andria* were made the subject of critical interpretation. Some twenty-five lectures were given by Dr. Warren on topics connected with the Roman drama, special attention being paid to the pre-Terentian literature, to the metres, and to the history of the text of Terence. Papers were presented embodying the results of special investigation by members of the seminary on the following subjects: on the *Didascalie*, on the peculiarities of G. Sulpicius Apollinaris as shown in the *Periochae*, on the position of adjectives and possessive pronouns relative to their substantives, on the critical value to be assigned to the citations of Terence found in Nonius Marcellus, on some striking differences between the metres of Plautus and Terence and those of Greek Comedy, on Terence's use of substantives as compared with that of Plautus, on the relative value of the different MSS. of Terence and their characteristic peculiarities, on Terence's use of the present participle, on the cases of ἀρχαϊσμός specially remarked upon by Donatus.

Dr. Warren also gave in the first half-year, a course of lectures on Latin Palæography, accompanied by practical exercises in reading fac-similes of manuscripts. In the latter half of the year, a similar course was given on Latin Epigraphy.

Additional courses have been conducted during the year, by :

Dr. Warren, in

Select Letters of Cicero and Pliny, Aulus Gellius, *three times weekly, first half-year.*
 Juvenal, Select Satires, *three times weekly, second half-year.*
 Horace, Select Satires, *once weekly, second half-year.*
 Reading at Sight.

Professor C. D. Morris, in

Lucretius and Plautus, *seven hours in two weeks, first half-year.*
 Tacitus, *four times weekly, second half-year.*
 Reading at Sight.

Dr. Spieker, in

Livy, four times weekly, first half-year.

Horace, three times weekly, second half-year.

(Classes in Latin Prose Composition were also conducted by each of the instructors in connection with the courses above named).

Dr. Emerson, in

Classical Antiquities, twice weekly, second half-year.

Students have privately read for examination the following books.

Cicero, *de Senectute* (7); *de Amicitia* (7); *pro Roscio Amerino* (6); *de Finibus*, I, (4); *ad Atticum* (1); *de Natura Deorum*, I, (4); *Philippica*, II, (1).

Horace, *Epodes, Carmen Saeculare*, (6).

Livy, XXII, XXIII, (1).

Lucretius, v, (1).

Martial, (1).

Ovid, Fasti, I, II, (6).

Seneca, de Tranquillitate Animi, Apocolocyntosis, (1).

Suetonius, Tiberius, (2).

Tacitus, Dialogus, Annals III, (2).

Terence, Andria, (4).

Vergil, Aeneid, v, VI, (1).

Shemitic Languages.

The centre of Professor Haupt's work was the Old Testament. Hebrew was read two hours weekly, and was constantly referred to in all the other lectures on Arabic, Ethiopic, Assyrian, Sumero-Akkadian, and in the Assyriological exercises. With the exception of the last, all the courses were intended for beginners. Accordingly the instruction was given not in lectures but after the seminary method.

In *Hebrew*, the elementary difficulties having been overcome, portions of the Pentateuch were read and afterwards, at sight, some chapters from the books of Judges, Ruth, and Kings. The interpretation was confined chiefly to a thorough philological analysis. As a number of students who had studied Hebrew for several years took part in this elementary course, exegetical and critical problems were incidentally discussed, but attention was devoted mainly to a thorough training in the forms of the language. The grammar used was Dr. Mitchell's translation of Gesenius-Kautzsch.

The *Arabic* class, for want of a suitable text book in English, had to use Petermann's *Brevi linguae Arabicae grammatica*. After a preparatory training in the sounds and forms, the first chapters of Genesis (Saadia's Arabic

version) were read and then the opening sura of the Qor'an and an easy historical text without vowels. In the grammatical analysis the forms and the most important syntactical phenomena were thoroughly explained with a constant reference to the points of contact as well as of difference with the Hebrew language. In order to make the students acquainted with the use of the national Arabic lexica, Arabic definitions, chiefly from the Qamûs, were given and these served at the same time as exercises in reading at sight unpointed sentences. There were also composed by the students written exercises, conjugations of the more difficult irregular verbs and translations of syntactically interesting sentences from English into Arabic.

In *Ethiopic*, after some introductory lectures on the history of Abyssinia and the position of the Geez language in the cycle of the cognate idioms, the outlines of the grammar were given, and afterwards the reading and analysis of the *Narratiunculæ de viris sanctis* in Dillmann's *Chrestomathia Aethiopica* were entered upon. The legends of St. Mark, Melchizedek, Abbâ Salâma, and Yared were read, and the beginning of the story of Macarius. In the grammatical interpretation the gutturals were especially treated of, with occasional references to Amharic and Tigrifia and the close connection of the Geez language with Assyro-Babylonian was pointed out.

In *Assyrian* as well as in *Ethiopic* the lack of a convenient text book necessitated the dictating of the grammar. Thereupon the cuneiform Annals of Sardanapalus in Vol. V of Sir Henry Rawlinson's *Western Asia Inscriptions* were read: the account of the first five campaigns, the two against Egypt, the third against Baal of Tyre, the fourth against Achsheri (cf. Ahishahar 1 Chron. 7, 10) of Van, the fifth against Elam, and the beginning of the sixth against Shamash-shum-ukin. Some written exercises with cuneiform paradigms of the Assyrian verbal inflexion, &c., were also composed.

In *Sumerio-Akkadian* the great three-columned Syllabary in Haupt's *Keilschrifttexte* (Leipzig, 1881) was explained. The principal phenomena of the phonology of the pre-Shemitic idiom were discussed, the origin of some Akkadian ideographs from the archaic Mesopotamian picture writing traced and Akkadian words which have passed into Shemitic idioms especially into the language of the Old Testament were pointed out.

In the *Assyriological Exercises* for more advanced cuneiformists the sixth tablet of the Babylonian Nimrod Epic in Haupt's new edition (Leipzig, 1884) was read, and before this, select bilingual exorcisms, incantations, prayers, hymns, and penitential psalms in parts II and III of Haupt's *Akkadian and Sumerian Texts* (Leipzig, 1881) and in Vol. IV of Sir Henry Rawlinson's *Cuneiform Inscriptions*, with special reference to Akkadian syntax and to the dialectical variations in the ancient Protochaldean idioms.

All the courses were two hours weekly, except Arabic and Ethiopic for each of which only a single hour weekly could be spared.

The proceedings of the *Shemitic Society* are given by the Recording Secretary, Dr. Arthur L. Frothingham Jr., in the April number of the *Circulars*.

Sanskrit, etc.

Five courses in Sanskrit and a course in Comparative Philology were conducted by Dr. Bloomfield :

1. A beginner's class in Sanskrit, throughout the year. The most essential elements of the grammar were acquired in as short a time as possible, and then the student was brought face to face with the language, learning its structure and laws, not in the abstract, but in its living body. Five books of the *Nala* were read and thoroughly analyzed. The aim was either to prepare for the more advanced study of Indian philology in this university, or for private study, which is too difficult without such an introduction.

2. The advanced class in Sanskrit read during the greater part of the year the drama *Çakuntala*. The main effort was directed towards the Prākṛit, which was constantly analyzed and compared with the Sanskrit. Toward the end of the year the class read selections from the Brāhmaṇa literature.

3. Introduction into the Rig-Veda, throughout the year. After a short course of lectures, select hymns of this Veda were read. The language was studied from the point of view of the classical language; constant reference was made to the critical helps such as the *padapāṭha*, *anukramaṇī* and the metres.

4. During the first half of the session the Kauçika-sutra was read from the manuscripts and with the aid of a MS. commentary.

5. A practical exercise in Sanskrit Prose writing was conducted from Christmas to the end of the year, on the basis of Bühler's *Elementarcursus des Sanskrit*.

6. A course in the general principles of Comparative Philology was carried on throughout the year. It was introduced by ten lectures on the leading questions of Indo-European comparative grammar, (phonetic law and analogy, bi-syllabic roots, agglutination, etc.). For the rest of the year Prof. Whitney's "Language and the Study of Language" was made the basis of instruction, but this was constantly supplemented by lectures, which aimed to carry the subjects treated in the book up to the present day.

German.

Advanced courses were conducted as follows :

Gothic. *Weekly, first half-year.* DR. DIPPOLD.

Middle High German. *Twice weekly.* DR. DIPPOLD.

Deutsche Stilübungen and Essays. *Monthly.* MR. RADDATZ.

History of German Literature, consisting of lectures in German. *On alternate Saturdays.* DR. DIPPOLD.

Lectures on The Beast Epic and Middle Low German were also given, weekly, during the first half-year, by DR. GERBER.

The undergraduate classes were conducted by Dr. Dippold, with Mr. Raddatz in charge of the classes in Prose Composition.

In the first year's course Goethe's *Egmont*, Schiller's *Maria Stuart*, and Selections from Erler's *Deutsche Geschichte*, and from Scientific Prose were read. The first section read further Lessing's *Minna von Barnhelm*; and the second, Schiller's *Wallenstein*.

In the second year's course Goethe's *Hermann and Dorothea*, *Faust*, selections from *Wilhelm Meister*, and Lessing's *Nathan* were read; with the addition of sight readings from *Emilia Galotti*.

There were weekly exercises in Prose Composition in both the first and second year's courses.

Dr. Lehmann conducted twice weekly a class in German Conversation, for undergraduates and advanced students, and the major course students met each month, during the second half-year, under the direction of Dr. Dippold, for the reading and discussion of essays on works read in the course.

Anglo-Saxon and English.

Advanced courses were conducted by Dr. Wood in :

Anglo-Saxon: *Béowulf*; *Cadmon's Genesis*. *Twice weekly.*

Old Saxon: *Heliand*. *Weekly, first half-year.*

The advanced students also met fortnightly, under the direction of Dr. Wood, for work in general English philology, reports and discussions. Three of the papers prepared during the year for these meetings, were subsequently read before the University Philological Association.

Additional classes, including the first and second year's courses for undergraduates, were conducted as follows:

Anglo-Saxon: Sweet's Reader; *Cynewulf's Elene*. *Twice weekly.* DR. WOOD.

Early English (1300-1400). *Twice weekly.* DR. WOOD.

Chaucer. *Weekly.* DR. WOOD.

Shakspeare: *Hamlet*. *Twice weekly, first half-year.* DR. BROWNE.

English Prose Writers. *Twice weekly, second half-year.* DR. BROWNE.

Elements of English Phonetics. *Weekly, first half-year.* DR. WOOD.

Grammatical and Rhetorical Exercises. *Weekly.* DR. WOOD.

History of the English Language. *Weekly, second half-year.* MR. TOLMAN.

Dr. Browne also conducted twice weekly a general introductory course (P. H. E.) in the History of English Literature, with readings. Essays have been written monthly, by each member of this class, and have been corrected and commented upon by the instructor.

Professor Corson gave twenty public lectures on the Poetry and Drama of the Restoration Period.

Four class lectures on English Literature at the end of the 15th and beginning of the 16th century, were given by Dr. Wood, who also gave eight public lectures on the literature of the period 1500-1580.

Mr. Woodworth met students daily for training in Vocal Culture.

Romance Languages.

Two advanced courses were conducted by Mr. Elliott during the year. For the first of these the work centred in the Anglo-Norman Dialect, for the second in a study of the earliest Old French Monuments. The following special subjects were treated:

Anglo-Norman:—Chardry's *Josaphas* (XIII century) was taken up and studied in its phonetic relations to earlier works in this dialect, and to the Franco-Norman and the Isle-de-France types. *Weekly, first half-year.*

Old French Seminary:—The Oaths of Strasburg were examined, according to facsimiles of the original MS., in their historical and linguistic relations to the Capitularia Regum and their bearing especially on the earliest development of the Romance system of phonetics. *Weekly, second half-year.*

Low Latin:—An Introduction, through the Inscriptions and *Joca Monachorum* given in P. Meyer's *Recueil d'Anciens textes Bas-Latins*, etc. *Second half-year.*

Provençal:—The Boethius Hymn, the Girard de Rossilho Epic, with divers extracts, taken according to age, from the literature of the tenth, eleventh, and twelfth centuries. *Weekly, during the year.*

Old French as Introduction to French Philology:—*Aucassin et Nicolette* with special reference to its phonology and dialect character. *Weekly, first half-year.*

Portuguese:—Os *Lusiadas* de Camões was read, attention being given to Old Portuguese, Old Spanish and Latin forms. *Weekly, first half-year.*

Wallachian:—An Introduction was given in Cionca's *Practische Grammatik der rumänischen sprache* together with extracts from Sionu, Alesandrescu and Alexandri. *Second half-year.*

Ladinian:—The Musso and Valtelline War Epics (xvi and xvii centuries) were read together with selections from the modern literature of Pallioppi, Caderas, Caratsch, and from the Folk Lore. *Weekly, through the year.*

Lectures:—(a) On Spanish and Portuguese Dialects, *weekly, through the year*; (b) On Comparative Romance Grammar, *weekly, through the*

year; (c) On French Phonetics, *thirty lectures*; (d) On Dante's *Divina Commedia*, *seven lectures*; (e) On the History of the Past Participle in French, *two lectures*.

The students of the French Major Course have read with Mr. Todd :

In Classical (xvii century) French, *Le Cid* (Corneille); *Athalie* (Racine), *L'Avare* (Molière);—In Middle (xvi century) French, the most important selections (considerably more than half) of Darmesteter and Hatzfeld's *Morceaux Choisis des Auteurs du xvi Siècle*, with a *précis* of Middle French Grammar, *twice weekly, first half-year*;—In Old French, the following selections from Bartsch's *Chrestomathie de l'ancien français*: *Serments de Strasbourg*, *Cantilène de Ste. Eulalie*, *La Passion*, *St. Léger*, *St. Alexis*, *Chanson de Roland*, *Amis et Amiles*, *Roman de la Rou*, *Contes del Graal*, *Roman de Renart*, *Roman de la Rose*, *Conquete de Constantinople*, *Chroniques de Froissart*, *Mémoires de Philippe de Comines*, *Perceforest*, *twice weekly, second half-year*;—Composition; exercises in style with the use of Gasc's *Prose Composition*. In the second half-year these were supplemented by original essay writing.

The students of the French Minor Course have read with Mr. Todd :

In Literary French, *Le Roi s'amuse*, by Victor Hugo; *Les Demoiselles de St. Cyr* and *Halifax*, by Alexandre Dumas, père; *Le Gendre de M. Poirier*, by Emile Augier and Jules Sandeau; and a part of *La Chanson du Jardinier*, by André Theuriot, *twice weekly*;—In Historical French, one hundred pages of Voltaire's *Histoire du Siècle de Louis XIV*, *weekly*;—In Scientific French, eighty pages of Milne-Edwards' *Précis d'Histoire Naturelle*, *weekly*. In connection with the two latter courses the class has studied nearly all of Breymann's French Grammar;—In Syntax and Idioms the class has had recitations and written exercises on the whole of Part I and twenty-five *thèmes* of Part II of Chardenal's *Exercises for Advanced Pupils*, *weekly*.

Mr. Fontaine has met the students of the Minor Course five times weekly for French conversation, with systematic instruction and drill in the pronunciation.

Mr. Todd has conducted special courses in Spanish and Italian:

The class in Italian has read the following authors:—Silvio Pellico: *Francesca da Rimini* and sixty chapters of *Le Mie Prigioni*; Goldoni: *Un Curioso Accidente*, *Gl'Innamorati* and *La Sposa Sagace*; and a short *Storia della Letteratura Italiana*. They have further read short selections from Tommaseo, Mamiani, Manzoni, Botta, Leopardi, Alfieri, Tassoni, Tasso, Ariosto, Petrarch, Boccaccio, and others, *twice weekly*. Short exercises in grammar have been given weekly, in connection with the above readings. A special class in Dante has read Cantos v, xii-xxvi of the *Inferno*, *weekly*.

The class in Spanish has read the following:—Lope de Vega: *El Desdichado por la Honra*; Calderon: *El Alcalde de Zalamea*; and the whole of Knapp's *Spanish Readings*, twice weekly. Short exercises in grammar have been given weekly, in connection with the above.

Two public courses on French Literature including twenty-three lectures and readings (in French) were given by M. Rabilon. He also conducted classes in French conversation.

HISTORY AND POLITICAL SCIENCE.

Seminary Work.

A. American Institutions and Economics.

The Seminary of Historical and Political Science has met regularly once a week for a session of two hours under the direction of Dr. H. B. Adams. During the past year, attention has been directed especially to the study of American Institutions and American Economics, with reference to specific topics suggested by the instructors in those departments of study.

Among the original papers presented and discussed by members of the Seminary are the following: The Seminary Method, by H. B. Adams; Christian Socialism, by R. T. Ely; Étienne Cabet and his Icarian Community, by Albert Shaw (Doctor's thesis, 1884); Virginia Institutions (three papers), by Edward Ingle; Judicial Procedure among Boys, by John Johnson; State and Local Taxation in Kentucky, by Arthur Yager (Doctor's thesis, 1884); Congressional Government, by Woodrow Wilson.

B. American Colonial History, by Dr. H. B. Adams.

An extra session of the Seminary, one hour a week through the year, has been devoted to the study of the sources of American Colonial History and to the prosecution of certain lines of research suggested by the instructor.

Attention was first called to the history of American discoveries and to early American cartography. The first settlements of Virginia, of New England, and of other colonies were then investigated. Papers were prepared by students upon such subjects as the following: the Spaniards in Florida, the Swedes on the Delaware, the Economic Beginnings of Pennsylvania, the Institutional History of Pennsylvania, the Beginnings of Connecticut, the Institutions of Virginia, Maryland, California and the Southwest, Oregon and the Northwest, etc. Some of this Seminary work will be elaborated into studies suitable for publication. Particular attention

was called by the instructor to the development of federal unity among the colonies. The phases of union before the Continental Congress were considered in detail, and some new lines of inquiry were pointed out.

Advanced and Collegiate Classes.

DR. H. B. ADAMS.

1. Historical Development of International Law.

An advanced course, three hours weekly, first half-year, introductory to the study of Bluntschli's *Völkerrecht* in the German text.

The instructor lectured upon the beginnings of international life as illustrated in ancient and mediæval history. He considered such topics as the inter-tribal and inter-municipal relations of the Orient; the inter-municipal institutions of the Greeks; the international influence of Rome and of the Christian Church; the Italian beginnings of modern international law; and the rise of the state system. In connection with this historical survey of the growth of internationalism, various special papers were presented by members of the class, upon such subjects as Carthaginian treaties, the Roman municipal system, the municipal leagues of the middle ages, etc. In connection with the reading and exposition of Bluntschli's code, a great variety of practical questions pertaining to international politics were discussed by individuals, *e. g.*, France in the Tonquin, the opening of China, the progress of Japan, the control of the Congo, international congresses and tribunals, the Panama Canal, the Monroe doctrine, etc.

2. The Old German Empire and the Rise of Prussia.

This was an advanced course, three hours a week, second half-year, after the conclusion of the course on International Law.

Lectures were given upon mediæval Germany, the origin and development of Prussia, its territorial and dynastic history, its relation to the break-up of mediæval unity and to the re-constitution of Germany. The course was designed to be introductory to the study of European Constitutions and Continental Politics, which subjects will be pursued during the next academic year. In connection with the lectures, oral examinations were instituted upon general topics of European history, which practical exercises will be continued during the coming year.

3. The Beginnings of Church and State.

An undergraduate course, twice a week, first half-year. The course consisted of lectures by the instructor and oral reports by members of the class, in which exercises ten graduate students participated. The instructor considered the origin and spread of Christianity, its

relations to the Roman empire and the Germanic peoples; the origin and growth of ecclesiastical institutions,—bishops, presbyters, synods, councils, etc.; the history of the papacy in the middle ages; and the Holy Roman Empire. The students prepared essays and reports upon topics connected with the course and were examined upon the lectures, together with certain prescribed authors,—Bryce, portions of Gibbon, Milman, and Ploetz's *Epitome*.

4. The Italian Renaissance.

A continuation of the above undergraduate course, two hours a week, second half-year. The course consisted chiefly of lectures upon the history of the Italian republics, the revival of learning and of art, and the relations of Italian to European history. Reading was required in such authors as Burckhardt, Symonds, Grimm, and Hallam; reports were prepared upon assigned topics.

5. Introductory Historical Course.

Twelve lectures to undergraduates entering upon the course in Physical Geography, History, and English.

DR. R. T. ELY.

6. Advanced Course in Political Economy.

This course, three hours weekly, throughout the year, consisted of class-lectures, student-lectures, and occasional special lectures.

The subjects to which particular attention was devoted were as follows: The Historical Development of Economic Theory; the Fundamental Principles of Political Economy, including definitions; Production; Value and Price; Distribution and Consumption; the means of Transportation and Communication; Free Trade and Protection; Social Movements in America. Each student read a paper on some phase of economic history and a number of essays were prepared on the History of Political Economy in the United States. A paper was also read on Taxation in Baltimore, and a careful study of Taxation in Pennsylvania has been begun. An essay on "Icaria, a chapter in the History of American Communism," was prepared and part of it read before the class. This essay by Dr. Albert Shaw is now in press and will be published in book-form by Messrs. G. P. Putnam's Sons.

7. Minor Course in Political Economy.

The first part of this course consisted of lectures on the Elements of Political Economy and a careful study of John Stuart Mill's Principles of Political Economy, with frequent reference to Walker's "Political Economy," and other works. The second part consisted of lectures on Historical Systems of Political Economy. At least two papers were prepared and read by each member of the class. A few of the subjects treated were as follows: The Wage-Fund Theory; Trades Unions and Strikes; The Internal Revenue of the

United States; the Income Tax; Communistic Experiments in the United States; The Independent Treasury System of the United States; the Theory of Value.

DR. J. F. JAMESON.

8. History of England and France.

This course, three hours weekly throughout the year, formed, with Dr. Adams's undergraduate work, the minor course in History. Green's England and Masson's Guizot's France were used as text-books. The recitations were accompanied by informal lectures. Reports upon topics, specially assigned, and studied under the direction of the instructor, were made. Additional reading in the standard authors was required. Formal lectures brought the course down to the present time.

9. History of Greece and Rome.

Twice weekly throughout the year. Text-books were used, informal and occasionally formal lectures were given, and selected topics were reported upon.

10. English Constitutional History.

Once a week. Stubbs' "Select Charters and other Documents illustrative of English Constitutional History" was used; the period studied was that from 1066 to 1216, special attention being paid to the development of the principles established by Magna Charta.

11. Physical Geography.

Lectures on the relations of Physical Geography to History (with special reference to Greece and Italy) were given once a week, beginning in January.

Courses of public lectures were also given in Hopkins Hall:—on the Relation of History and Politics, by Professor H. VON HOLST, of the University of Freiburg, and on the Study of Roman Legal History, by Professor JAMES BRYCE, of the University of Oxford.

PHILOSOPHICAL COURSES.

PROFESSOR G. STANLEY HALL lectured twice a week through the second half-year on Psycho-physics.

The course was mainly devoted to the physiology of the senses, cerebro-spinal localization and attention, as introductory to a course on psychology, beginning with instinct, during the coming year. Demonstration work was done and courses of reading posted.

Six advanced students engaged in special investigations in the room set apart for psycho-physic research and results were obtained that will be published later.

Dr. Hall lectured twice a week on psychological ethics, mainly historical, beginning with ethical conceptions and theories of the Greeks and concluding with Kant, and considerable attention was given to inductive methods of studying ethical problems.

He also gave twelve lectures to the matriculate students on Mental Hygiene.

PROFESSOR G. S. MORRIS gave during the first half-year:

1. A course of three lectures weekly on the History of Philosophy in Germany, with special reference to the movement from Kant to Hegel.

The beginnings and the general character of the history of modern philosophy were first briefly sketched; the doctrines of Descartes, Spinoza, and Leibnitz were described in greater detail; and then, after a summary account of the philosophical situation in Germany prior to Kant, the doctrines of Kant were analyzed, with special reference to the unity of the three *Critiques*, and to the comprehension of the fundamental problems of philosophy, as anew-presented by Kant, (1) in the light of the results of ancient philosophy, and (2) with reference to the further treatment of these problems by the successors of Kant. This course was designed for advanced students.

2. A Seminary course, for the most advanced students only, was conducted, the subject of study being Spinoza's *Ethics*. The work in this course was restricted especially to the first, second, and fifth parts of Spinoza's masterpiece.

The object of the study was to attain an exact knowledge of the nature of Spinoza's fundamental conceptions and of his method, to estimate their value and significance in the light of the larger historic results of philosophic inquiry, and, in some measure, to consider their relation to the fundamental conceptions of modern science. In accordance with the Seminary method, the different members of the class by turns took the lead in the analytic exposition of the text and criticism of the argument.

3. An outline of the general History of Philosophy, both ancient and modern, was given in a series of two lectures weekly, throughout the first half-year.

This was intended for undergraduates and others desiring to take advantage of such a course. Members of the L. E. P. course were required to listen to and be examined on twelve lectures relating to modern philosophers.

4. A course of four public lectures on the Philosophy of Social Relations was also given by Professor Morris.

MR. C. S. PEIRCE gave a course of lectures in Mathematical Logic, twice weekly through the year; a course in Philosophical Terminology, weekly during the first half-year; and a course in Probabilities, twice weekly during the second half-year.

He also guided a company of students in studying the psychology of great men.

MR. HARRIS gave an elementary course in Logic during the first half-year and a course in Practical Ethics during the second half-year.

Two public lectures on the Religious Aspect of Philosophy were given by Dr. Josiah Royce, of Harvard College.

DRAWING.

Arrangements have been made by which MR. HUGH NEWELL devotes five afternoons in the week to instructing both undergraduate and graduate students in freehand drawing, in perspective, descriptive geometry, and other branches of mathematical drawing.

PHYSICAL TRAINING.

The department of Physical Training has been in charge of DR. E. M. HARTWELL.

The interest taken by all classes of the members of the University in the Gymnasium, which was opened for use December 15, 1883, has been noteworthy and encouraging. Although attendance at the Gymnasium has thus far been wholly voluntary, more than two-thirds of the members of the University enrolled during the past year have elected to undergo a physical examination by the Director of the Gymnasium, and to avail themselves of the privileges of the department under his counsel and direction. Henceforth all candidates for the degree of Bachelor of Arts will be required to take the course in Physical Training, which will include lectures and lessons in Elementary Physiology and Hygiene as well as a prescribed minimum amount of physical exercise; such exercise and its amount to be determined by the Director for each individual.

It is gratifying to note that good order and gentlemanly behavior have uniformly prevailed in and about the Gymnasium. The

Gymnasium certainly affords valuable means for the promotion of social intercourse and good fellowship amongst the students as well as for recreation and exercise.

A tennis court has been completed on the lot adjoining the Gymnasium. The Clifton playgrounds are now in good condition and will henceforth be available for the purposes of out door sports.

GRADUATES OF THE YEAR.

Twenty-three undergraduates have come forward to the baccalaureate degree during the year, namely :

BACHELORS OF ARTS, 1883-84.

Albert Clayton Applegarth, Baltimore.	William Ridgely Orndorff, Baltimore.
Charles Walter Artz, Hagerstown.	George Dobbin Penniman, Howard County.
Walter Bliss Canfield, Baltimore.	William Henry Perkins, Baltimore.
George Gibson Carey, Jr., Baltimore.	George Clement Stokes, Jr., Govans-town.
Walter Kennedy Cromwell, Baltimore County.	William Jones Thomas, Baltimore.
Charles William R. Crum, Jefferson.	William Ferdinand Walz, Baltimore.
Harry Friedenwald, Baltimore.	Frederick Henry Wilkens, Baltimore.
William Lindsay Glenn, Baltimore.	— — —
John Hinkley, Baltimore.	<i>Extra Ordinem.</i>
Charles Howard Howard, Baltimore.	George Wishart Edmond, Portland, Maine.
John Deering Lord, Jr., Baltimore.	Charles Howard Shinn, San Francisco, California.
Jere Williams Lord, Baltimore.	
William Patrick Lyons, Baltimore.	
Edgar George Miller, Jr., Baltimore.	

Fifteen candidates, who had presented the requisite theses and had also passed the examinations successfully, were made doctors of philosophy;—namely :

DOCTORS OF PHILOSOPHY, 1883-84.

Herbert William Conn, of Fitchburg, Massachusetts, A. B., Boston University, 1881. His principal subject has been Animal Morphology, the

subsidiary, Animal Physiology and Histology. His thesis on the "Life-History of *Thalassemia Millita*" has received one of the Walker prizes of the Boston Society of Natural History.

Ellery William Davis, of Oconomowoc, Wisconsin, S. B., University of Wisconsin, 1879. His principal subject has been Mathematics, the subordinate, Physics. He submitted a thesis on the "Parametric Representation of Curves."

David Talbott Day, of Baltimore, A. B., Johns Hopkins University, 1881. His principal subject has been Chemistry, the subordinate, Physics. He submitted a thesis on the "Changes effected by Heat in the constitution of Ethylene."

John Dewey, of Burlington, Vermont, A. B., University of Vermont, 1879. His principal study has been Philosophy, the subsidiary, Political Science. He submitted a thesis on the Psychology of Kant.

James Reynolds Duggan, of Macon, Georgia, A. B., Mercer University, 1877, and M. D., Jefferson Medical College, 1879. His principal subject has been Chemistry, the subordinate, Biology. He submitted a thesis on "Fermentation."

William Henry Howell, of Baltimore, A. B., Johns Hopkins University, 1881. His principal subject has been Animal Physiology and Histology, the subordinate, Chemistry. He submitted a thesis entitled "Experiments upon the Blood and Lymph of the Terrapin, and the origin of the Fibrin formed in Coagulation."

Hans Carl Günther von Jagemann, of Naumburg, Germany, a graduate of the Naumburg Gymnasium. His principal subject has been the Romance Languages, the subordinate, English and German. He submitted a thesis on the "Anglo-Norman Vowel System in its relations to the Norman words in English."

Edward Harrison Keiser, of Allentown, Pa., B. S., Swarthmore College, 1880. His principal study has been Chemistry, the subordinate, Physics. His thesis was on "The Existence of Active Oxygen."

Arthur Lalande Kimball, of Plainfield, N. J., A. B., Princeton College, 1881. His principal subject has been Physics, the subsidiary, Mathematics. He submitted a thesis on the "Value of the B. A. Unit of Electrical Resistance in Absolute Measure."

Henry Leslie Osborn, of Madison, N. J., A. B., Wesleyan University, 1878. His principal subject has been Animal Morphology, the subsidiary, Animal Physiology and Histology. His thesis on "The Gill in some forms of Prosobranchiate Mollusca" has already been printed in the Studies from the Biological Laboratory.

Charles Albert Perkins, of Ware, Mass., A. B., Williams College, 1879. His principal subject has been Physics, the subordinate, Chemistry. He submitted a thesis on the "Variation of the Magnetic Permeability of Nickel at different temperatures."

Albert Shaw, of Grinnell, Iowa, A. B., Iowa College, 1879. His principal study has been History, the subordinate, Political Science. His thesis

entitled "Étienne Cabet and the Icarian Community," has been published in book-form by G. P. Putnam's Sons, New York.

Henry Newlin Stokes, of Moorestown, N. J., S. B., Haverford College, 1878. His principal subject has been Chemistry, the subsidiary, Animal Physiology and Histology. His thesis was on "The Nature of the Sulphide obtained by oxidizing α -Naphthalene-sulphamide."

Lewis Webb Wilhelm, of Baltimore, A. B., Johns Hopkins University, 1880. His principal subject has been History, the subordinate, Political Science. His thesis entitled "Sir George Calvert, Baron of Baltimore," has been published by the Maryland Historical Society.

Arthur Yager, of Georgetown, Ky., A. B., Georgetown College, 1879. His principal subject has been History, the subsidiary, Political Science. He submitted a thesis on "State and Local Taxation in Kentucky."

UNIVERSITY SOCIETIES.

The several scientific associations, composed of members of the faculty and advanced students, have met regularly, as heretofore, for the presentation and discussion of original papers.

1. The Scientific Association, under the presidency of Professor Martin, has had eight meetings. Papers have been read by: —

W. K. Brooks, on the methods used in investigating the oyster beds of the Chesapeake Bay.

H. W. Conn, on the evidence of a protozoa stage in crab development.

W. T. Councilman, on a case of endocarditis in a dog.

D. T. Day, note on the action of heat on ethylene.

C. S. Dolley, on an infusorian recently observed in Baltimore water.

H. H. Donaldson, resumé of some recent work on the brain.

G. Stanley Hall, on compound reaction time.

C. S. Hastings, on the scientific results of the eclipse expedition.

W. H. Howell, on the coagulation of the blood.

H. Newell Martin, on symbiosis.

T. W. Mills, notes from the Marine Laboratory.

H. L. Osborn, on the molluscan gill.

H. F. Reid, note on auroras.

Ira Remsen, the evidence for the existence of a third form of oxygen; on the pyridene period; on the glucose industry of the United States.

H. A. Rowland, note on the solar spectrum; on the dynamic theory of diffraction.

W. E. Story, a notation for binary arithmetic and its use.

G. H. Williams, notes on a geological expedition on the Upper Saguenay; an account of the discovery by Dr. Hans Rensch, of fossils in the crystalline schists of the peninsula of Bergen, in Norway.

2. The Philological Association, under the presidency of Professor Gildersleeve, has had eight meetings. Papers have been read by : —

M. Bloomfield, on certain irregular Vedic subjunctives or imperatives; on a proposed edition of the Kāuṣika-sūtra of the Arthava Veda; the probability of the existence of phonetic law.

M. W. Easton, uniformity and analogy.

A. E. Egge, on inchoative or *n*-verbs in Gothic and other Germanic dialects.

A. M. Elliott, the Nahuatl-Spanish dialect of Nicaragua; the development of verbal parasynthetics in *a* in the Romance Languages.

A. Emerson, a communication from Prof. E. Wölfflin on the formation of a new Thesaurus Linguae Latinae.

B. L. Gildersleeve, on Ribbeck's life of Ritschl; on the final sentence in Greek.

J. R. Harris, on the exemplar of codex C and the Apocalypse; notes on the Sinaitic and Vatican codices.

J. A. Harrison, the syntax of the old past participle and *avoir* in French poetry of the XIIIth century.

P. Haupt, on the Babylonian "woman's language."

C. W. E. Miller, rhythmical pronunciation of Greek and Latin prose and a few remarks on accent.

C. D. Morris, the rights of a Greek metropolis over its colonies; on K. Brugmann's recent grammatical studies.

E. G. Sihler, studies in Dinarchus.

E. H. Spieker, note on a certain use of the Sanskrit word *yathā*.

A. S. Tolman, musical notation in the study of blank verse.

M. Warren, note on Plautus Mercator.

H. Wood, on T. L. Beddoes, a survival of style.

C. B. Wright, on parallelisms in Beowulf.

3. The Mathematical Society, under the presidency of Professor Sylvester, and later under that of Dr. Story, has had seven meetings. Papers have been read by : —

- G. Bissing, on the degeneration of unicursal curves; a note on developable surfaces; unicursal curves in n -flat space; on curvature in n -flat space.
- T. Craig, on a certain class of transcendental functions.
- E. W. Davis, some remarks on unicursal curves.
- W. P. Durfee, a note on the divisibility of numbers; on the number of substitutions of n letters which leave k of them unaltered.
- G. S. Ely, a note on partitions.
- F. Franklin, an elementary demonstration of Stirling's theorem; two notes.
- A. S. Hathaway, a demonstration of a theorem of Clebsch; the reduction of quadratic forms to sums of squares; on a form for the residues of composite moduli; a note on cycles.
- C. S. Peirce, on the mode of representing negative quantity in the logic of relatives.
- W. E. Story, on the intersection of linear and quadratic loci; a symbolical demonstration of Taylor's theorem; on a system of straight lines determined by two given lines; a note on ruled surfaces; on the equations which determine the directions of the axes of a quadric surface.
- J. J. Sylvester, on the relation of minor determinants of products to minors of the factors.

4. The Historical and Political Science Association, under the direction of Dr. H. B. Adams, has held frequent meetings. Among the papers read were the following:—

- H. B. Adams, on the seminary method.
- James Bryce, a criticism of De Tocqueville.
- Edward Channing, on town and county government in the United States.
- Samuel Dike, on the divorce question in the United States.
- N. H. Eggleston, on forestry in the United States.
- R. T. Ely, on Christian socialism.
- H. P. Goddard, Luther Martin, a biographical study.
- Charles Gross, on the guild merchant, an introduction to English municipal history.
- E. M. Haines, on township organization in the west.
- James A. Harrison, on old Teutonic life in Beowulf.
- H. von Holst, the study of slavery as an institution.
- Edward Ingle, on the county institutions of Virginia; the Virginia parish.
- Jesse Macy, on the genesis of civil government in Iowa.
- E. D. Neill, records of the Virginia company, and notes on early Maryland history.
- J. W. Powell, on Indian institutions.

- Josiah Royce, on the development of society and government in California.
 W. B. Scaife, on the study of Roman law and history.
 Albert Shaw, Étienne Cabet and his Icarian community.
 C. H. Shinn, a new labor problem in California; the origin of institutional government in Oregon.
 Woodrow Wilson, on congressional government.
 A. Yager, taxation in Kentucky.

5. The Metaphysical Club, under the guidance of Messrs. G. Stanley Hall, G. S. Morris, and C. S. Peirce, has had eight meetings. Communications were presented as follows:—

- A. T. Bruce, on the design argument.
 J. Dewey, on the psychology of consciousness; Delbouef on living and dead matter; the new psychology.
 G. Stanley Hall, the nisus formativus in sane and insane minds.
 J. R. Harris, on the syllogism.
 E. M. Hartwell, on the body as a spiritual residence.
 J. Jastrow, a review of Galton's "inquiry into human faculty;" materialism, spiritualism, and the scientific spirit.
 G. S. Morris, on the philosophical conception of life.
 C. S. Peirce, on the logic of religious life.
 L. F. Ward, on mind as a local factor.

6. The Society for Shemitic Philology. This association was organized during the year under the guidance of Professor Haupt. Papers have been read at the meetings as follows:—

- C. Adler, the city of Harran and its place in ancient history; the differences of pronunciation of Hebrew among the Jews of different countries of Europe; on a Hebrew MS. of c. 1300.
 W. M. Arnolt, on Shemitic loan-words in old Greek.
 A. L. Frothingham, Harran and its condition after the Christian Era; on the history of Syriac literature from the beginning of the Christian Era to the thirteenth century.
 J. R. Harris, an etymology of the name of S. Luke given by Isadore of Seville.
 A. H. Huizinga, on the Massora and its critical and editorial treatment.
 C. Lehmann, the people and language of the Medes; the exchange of *šin* and *non* in the proto-Babylonian language.

7. The Naturalists' Field Club, Dr. G. H. Williams, president.

This was organized by members of the University, but includes in its list of members other residents of Baltimore interested in Natural History. The club works in three sections—Geology and Mineralogy, Zoölogy, Botany. Each section elects its own officers and arranges for its own field excursions and its own meetings. There are also monthly meetings of the whole club, when the chairmen of the different sections report progress and an address on some topic of Natural History is given by one of the members.

The mineralogical collections of the club are preserved in the Chemical Laboratory; the botanical and zoölogical in the Museum of the Biological Laboratory.

8. During the year an Archæological Society has been organized. Several meetings have been held, at which reports and communications have been presented.

PUBLICATIONS.

1. Four numbers, making the sixth volume of the American Journal of Mathematics, have been issued during the year. Papers by members of the university have been contributed as follows:—

- T. Craig, on quadruple theta functions; on certain groups of relations satisfied by the quadruple theta functions; on theta functions with complex characteristics.
- A. L. Daniels, notes on Weierstrass' methods in the theory of elliptic functions.
- G. S. Ely, the method of graphs applied to compound partitions.
- F. Franklin, note on "the development of an algebraic fraction."
- A. S. Hathaway, some papers on the theory of numbers.
- H. A. Rowland, on the propagation of an arbitrary electro-magnetic disturbance, on spherical waves of light and the dynamical theory of diffraction.
- W. E. Story, on the absolute classification of quadratic loci, and on their intersections with each other and with linear loci.

2. Six numbers of the American Chemical Journal have appeared within the year, bringing the series down to the third number of the sixth volume. They have contained papers by members of the University as follows:—

E. H. Keiser, estimation of sulphur in organic compounds.

H. N. Morse and W. S. Bayley, on haydenite.

Ira Remsen, on a new class of compounds analogous to the phthaleins; (and R. D. Coale,) on sinapic acid; (and W. C. Day,) oxidation of β -cymenesulphamide; (and E. H. Keiser,) on the conduct of moist phosphorus and air towards carbon monoxide; oxidation of para-dipropylbenzene-sulphamide; quantitative estimation of carbon in ordinary phosphorus.

3. The fourth volume of the American Journal of Philology has been completed during the year, and two numbers of the fifth volume have been issued. Papers by members of the University have appeared as follows:—

W. J. Alexander, participial periphrases in attic prose.

M. Bloomfield, on certain irregular vedic subjunctives or imperatives; on the probability of the existence of phonetic law.

A. M. Elliott, the Nahuatl-Spanish dialect of Nicaragua; verbal parasynthetics in *-a* in the Romance languages.

A. L. Frothingham, Jr., an historical sketch of Syriac literature and culture.

B. L. Gildersleeve, on the final sentence in Greek.

Paul Haupt, the Babylonian "woman's language."

J. R. Harris, stichometry.

E. H. Spieker, on direct speech introduced by a conjunction.

H. Wood, T. L. Beddoes, a survival in style.

4. Part one of volume three of the Studies from the Biological Laboratory was issued in March. It contained the following papers:—

H. W. Conn, significance of the larval skin of decapods; life history of thalassema.

H. L. Osborn, of the gill in some forms of prosobranchiate mollusca.

5. Ten numbers of the second volume of *Studies in Historical and Political Science* have appeared. They contain two papers by members of the University, namely:—

H. B. Adams, on methods of historical study.

R. T. Ely, on the past and present of political economy.

6. Six numbers of the *University Circulars*, containing 138 quarto pages have also been issued during the year. The Circulars are published at convenient intervals during the academic year for the purpose of communicating intelligence to the various members of the University in respect to work which is here in progress, as well as for the purpose of promulgating official announcements from the governing and teaching bodies. Although these Circulars are designed for the members of the University, they have frequently been called for by institutions and libraries at a distance, and also by individuals who are interested in the literary and scientific activity of this University. Subscriptions and exchanges are therefore received.

THE LIBRARY.

The Library has continued to grow rapidly and now numbers 22,123 volumes. During the year many valuable gifts have been received of which

a list is given upon a later page. The number of periodicals, including the transactions of learned societies, which are taken in by subscription or by exchange is 420. If to this collection be added the list of those which are received by the Peabody Institute and other libraries of Baltimore, it will be seen that the student among us has ready access to all the chief sources of information in respect to the progress of science and literature.

The size of the library calls for enlarged accommodations. Notwithstanding the formation of several branch libraries, in connection with different lecture rooms, the shelf-room is still inadequate to the proper arrangement of the books. Strong objections have been made to the removal of portions of the collection to other buildings, and the Library Committee felt obliged in the course of the last winter to make public an expression of their opinion that the distribution of books had gone to a limit where it is best to stop. The bringing of the Bluntschli books to the floor above the principal reading room, and the placing there of other works in history and political science, have added greatly to the facilities for instruction and study in those branches of knowledge.

Our relations with the Library of the Peabody Institute and with the other libraries of Baltimore continue to be co-operative. It is a great

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advantage to all who are engaged in important researches that so many of the long scientific series, so many of the collections of historical documents, and so many costly works in archaeology have been brought together by the Peabody foundation and made accessible to those who can appreciate their value. The publication of the first volume of the catalogue, on which a vast amount of labor has been expended, renders the Peabody Library more accessible than ever. The Library of the Surgeon-General's Office in Washington is constantly made useful to students of Biology, and through the agency of the University is accessible also to those members of the medical profession in Baltimore who wish to borrow books. From other libraries at a distance books have been occasionally lent to us.

MINERALOGICAL CABINET.

Since the appointment of Dr. G. H. Williams to be an Associate in Mineralogy, increased attention has been given to the mineralogical cabinet, the nucleus of which was formed several years ago, under the superintendence of Dr. H. N. Morse. The collection is now well adapted to instruction and to private study, representing as it does nearly all the common species, and containing also a few specimens of unusual interest and value.

In order to facilitate advanced work in mineralogy, the most important pieces of apparatus used abroad in crystallographic and optical investigations of minerals have been secured, as well as a large set of both wooden and glass models of crystals for use in the lecture room. For special study of the microscopic structure of rocks, facilities are also afforded in keeping with the rapidly increasing interest manifested in this department of study. A microscope especially constructed for petrographical research, simple apparatus for preparing rock sections, together with a collection of nearly one thousand hand specimens of typical European rocks and between seven and eight hundred thin sections of rocks and minerals, prepared both in this country and in Europe, have recently been purchased, and are now, under proper guidance, placed at the disposal of students in appropriate rooms upon the third floor of the Chemical Laboratory.

The University has recently acquired by purchase a mineral collection, of sixteen hundred specimens, formed during the last twenty years by Professor O. D. Allen of the Sheffield Scientific School of Yale College. The specimens are of small size, but are choice and typical. Besides common minerals from the best localities, American and European, there are interesting suites, almost if not quite unique, from localities which were

explored and in some cases discovered by Professor Allen. Among them may be mentioned, chondrodite from the Tilly Foster Iron mine at Brewster, N. Y.; zircon, cancrinite, etc., from Litchfield, Me.; muscovite crystals from Buckfield, Me.; beryls from North Madison, Ct.; datolite from Tariffville, Ct., etc.

Another purchase has been made of a mineral collection, comprising some twelve hundred specimens, belonging to Professor Oren Root of Hamilton College. This is especially rich in crystals from Rossie and other old localities in northern New York, which are now no longer productive. A large suite of pseudomorphs in the Root collection, makes a valuable addition to the University Cabinet.

The thanks of the University are due to Mr. George T. Marye of San Francisco, who is gradually making for us a complete suite of the ores of the Pacific coast, which are forwarded to the University without charge by the liberality of Wells, Fargo & Co. and the Adams Express Company. Several beautiful specimens bought in Europe by Dr. Christopher Johnston of Baltimore, have been by him presented to the collection. Messrs. Hugh Sisson & Sons, manufacturers, have also given a set of specimens of polished marbles, selected to show a variety of

aspects. Other gifts have been received from Rt. Rev. Bishop Randolph, Dr. C. Pennington, and the Maryland Academy of Sciences.

EDUCATIONAL LECTURES.

For the sake of guiding in some degree the thoughts of those who are expecting to devote their lives to the work of teachers, a course of lectures was given last winter and spring by various instructors in this University. The audience was carefully restricted to the Fellows and to other graduate students, so that the lecturer might be conscious of the presence of a class who were personally prepared for and interested in the discussion of the topics proposed. The lectures were given in the chemical lecture room at ten o'clock on successive Saturdays, and the number of persons present was usually from sixty to seventy. The topics and the names of the lecturers are as follows :

- I. The present state of university and collegiate instruction in this country, by D. C. Gilman.
- II. Recent observations on educational foundations in Europe, by D. C. Gilman.
- III. The educational value of grammar, by B. L. Gildersleeve.
- IV. The future sphere of classical philology, by B. L. Gildersleeve.
- V. The educational value of specialization and original work, by G. S. Hall.
- VI. What to teach in biology, by H. N. Martin.
- VII. Educational value of the study of chemistry, by I. Remsen.
- VIII. Modern methods in the study of history, by H. B. Adams.
- IX. Observational element in mathematics, by C. S. Peirce.
- X. The naïve in education, by H. Wood.

A second course of weekly educational lectures has been arranged for the next academic year.

The undergraduates were also assembled as a body for the purpose of hearing several lectures more or less connected with their regular pursuits. The following topics were discussed by the lecturers whose names are given : —

Introductory lecture, by D. C. Gilman.

Four lectures on mental hygiene and moral regimen, by G. S. Hall.

On habits of literary composition, and on the preparation and correction of printer's copy, by W. H. Browne.

On the right uses of translations, by C. D. Morris.

On methods of physical training, by E. M. Hartwell.

On vocal culture, by C. L. Woodworth.

Reports on recent class-work respecting pre-historic archæology were made at one assembly, by some of the members of the class in history.

A course of five public lectures on educational topics was also given by Professor Hall.

CHESAPEAKE ZOÖLOGICAL LABORATORY.

The report of the Director of the Chesapeake Zoölogical Laboratory, for the seventh year of its operations, is given in the appendix. In addition to what this laboratory has done for the advancement of science, it has been very useful to the fisheries of the Chesapeake by the light it has thrown on the natural history of the Oyster. During the past winter, Dr. W. K. Brooks, the Director, spent a great deal of time as a member of the Oyster Commission of the State of Maryland, in the preparation of a report to the

Legislature which embodies not only his discoveries in respect to the propagation of the oyster and the possibility of artificially developing the oyster in the very earliest stages of its life,—but also a vast amount of information in respect to the protection and improvement of the oyster fisheries. This report was published by the Legislature in a quarto volume, illustrated with maps and plates, and is likely to be the standard authority on this subject for a long period to come.

EXCURSION MAP OF BALTIMORE.

For several years the need of a good map of the neighborhood of Baltimore has been under discussion. In the course of last winter, Mr. A. L. Webster, formerly of the U. S. Geological Survey, acting in behalf of the Field Club of the Johns Hopkins University, presented to the Trustees a scheme for the construction, at a moderate cost, of an excursion map which should serve as a guide to the environs of Baltimore. His proposals were carefully considered and approved and the requisite appropriation for the map was made. The co-operation of the U. S. Coast and Geodetic Survey, and of the U. S. Geological Survey was secured, and the services of Mr. L. Nell, as a topographical draughtsman, were engaged. The map is now published on a scale of an inch

to the mile, and it gives the roads and brooks and water front with approximate accuracy. It lacks contours and other indications of the heights. The region covered is a square, the sides of which are twenty-five miles long. Only a few copies of the map have been printed, as it is the intention of those who are interested in it, to note all deficiencies and inaccuracies, and a short time hence to publish a second more complete edition.

ACKNOWLEDGMENTS.

Many friends of the University have contributed during the year to its collections, and grateful acknowledgments are due to the persons below mentioned.

The gifts to the Library are so numerous that they are separately mentioned, as usual, in the appendix. Special acknowledgments may here be given to Messrs. HENRY HOLT & Co., Publishers, of New York, for continuing to send us their publications as they appear; and to Messrs. G. P. PUTNAM'S SONS, for copies of several of the works which they have published.

A large and valuable collection of American newspapers, printed in New York and Philadelphia during the Civil War, was given to the University by HON. S. C. PERKINS of Philadelphia, who has also taken great pains to secure for us a collection of the municipal documents of Philadelphia, and of the State documents of Pennsylvania.

MR. MENDEZ COHEN of Baltimore, and DR. HENRY M. COHEN of New York, for their liberality in contributing their interest and ownership in the Cohen collection of Egyptian antiquities.

MR. WILLIAM ELLINGER for depositing in the historical rooms a valuable collection of lacustrine relics illustrating the stone and bronze ages in Switzerland.

MR. A. L. FROTHINGHAM, JR. for several terra cotta lamps, some of which were found in Christian catacombs, and some in the bed of the Tiber.

MRS. LANGDON WILLIAMS, L. WILLIAMS, and W. K. WILLIAMS for specimens of Etruscan and Roman pottery, and for a collection of Roman coins.

RT. REV. DR. RANDOLPH, of Virginia, for gifts of Indian relics.

COL. BENJAMIN TAYLOR, for gifts of Indian relics.

REV. CHARLES R. HALE, D. D., for depositing in the historical rooms his library of ecclesiastical history, to be there retained during his absence in Europe.

MRS. FRANCIS LIEBER, for depositing in the Bluntschli collection annotated copies of her husband's writings, with some other manuscripts of his, and for giving printed copies of his republished books. Having heard of the Lieber donation, JUDGE M. R. THAYER of Philadelphia, offered us as personal mementoes an ink-stand which belonged to Mr. Justice Story of the U. S. Supreme Court, and a pen which was Francis Lieber's.

At the request of Dr. Adams, Mrs. Lieber also presented to the historical rooms a bust, in plaster, of Dr. Lieber; and Mrs. Sparks presented a bust, in plaster, of Jared Sparks, the historian, once resident in Baltimore.

To the historical rooms, a friend of the University has given plaster casts of the busts of Cicero, Dante, John Locke, and Alexander Hamilton.

MR. J. S. CUMMINS, photographer, of Baltimore, has presented to the University large sized photographs of several members of the Faculty.

The departure from Baltimore of Professor Sylvester, led to the presentation of several likenesses of this eminent mathematician:—a portrait in oil by the artist, Mr. Harper Pennington of Baltimore; a likeness modelled in plaster by the artist, Mr. Léonce Rabillon; a medallion likeness in electrotype, (from which the medal struck in commemoration of his connection with this University was cut), and a silver copy of the medal itself, presented by Mr. John W. McCoy. The medal was designed by Mr. Charles F. Barber, and was struck at the U. S. Mint in Philadelphia.

PROFESSOR MARTIN has given to the Biological laboratory engravings and photographs of Darwin, Huxley, Foster, Balfour, Ludwig, and Kronecker.

The Students in the Biological laboratory have presented a plaster cast of the bust of Charles Darwin, by C. Lehr, Jr.

Through the agency of the publishers, Messrs. G. P. Putnam's Sons, and at the request of Prof. R. D. Irving, forty pages of the autograph manuscript of Washington Irving, taken from the "Spanish Papers," have been given to the collection of historical autographs by Miss Catherine Irving and Mrs. Oscar Irving. Mr. E. A. Freeman has also sent the manuscript of his article on French-English Towns, and Hon. John H. B. Latrobe a MS. account of a visit which he made to President Madison, near the close of his life, at Montpellier.

LECTURES BY SIR WILLIAM THOMSON.

I am reluctant to wait for the completion of another year, before making mention of the important course delivered to the mathematical phys-

icists of this University by Sir William Thomson, Professor in the University of Glasgow. Professors and students of physics from other places were invited to follow these lectures, and thirty such persons attended with more or less regularity. Several professors, some of them from States in the far west, gave up their own classes and remained in Baltimore during the entire course.

The subject of the lectures was Molecular Dynamics, and they treated particularly of the wave theory of light. Stenographic notes were taken, which will soon be printed by the papyrograph process, and published. The course consisted of eighteen lectures, which were delivered between the first and nineteenth of October, 1884. In addition, the lecturer gave one public lecture on the Rigidity of the Earth.

At the conclusion of his course, those who had followed the lecturer united in an address of thanks to him, and in another to the Trustees of the University, and arrangements were made by the same persons to present to Sir William Thomson, as a memorial of his visit, one of the concave gratings devised by Professor Rowland for the study of the solar spectrum, and ruled under his direction.

DEATH OF MR. JOHN W. GARRETT.

As these pages are passing through the press, death has removed one of the original members of

the Board of Trustees, Mr. John W. Garrett, who died September 25, 1884.

In the foundation of this institution, Mr. Garrett co-operated heartily with the President and Professors, as well as with the Trustees. As it grew, he took pride in its increasing influence and in the prospect of its enduring strength, although in the latter part of his life he disagreed with a majority of the Trustees in regard to the purchase of additional land and the construction of additional buildings near the present site of the university class-rooms in the city of Baltimore.

To those who came to Baltimore as strangers, whether teachers or visitors, he extended a hospitable welcome which will always be remembered with gratitude. His reminiscences of the Founder, his desire that the city of his birth and residence should become a seat of the highest education, and his hope that new attractions would be added to those already given to Baltimore, were among the subjects on which he frequently conversed; and if his life had been spared, he would doubtless have matured certain plans on which his mind was thus known to be engaged. By a will which was dated near the close of his life, he made a generous contribution to the Association for the Improvement of the Condition of the Poor, and he directed that his executors should, out of the net income of his estate, devote the sum of \$50,000 annually to such objects

of benevolence, to educational purposes, to aid virtuous and struggling persons, and to such works of public utility as are calculated to promote the happiness, usefulness, and progress of society, the apportionment of the gift to depend on the judgment and discretion of three members of his family, whom he designated as trustees.

CONCLUSION.

In concluding this report, I beg leave to express once more the confidence which I have, and which I believe to be shared by all those who are concerned in the instruction and government of this university, that the foundations are firmly laid, and that the superstructure is rising quite as rapidly as is best. We have seen thus far no reason to deviate, in any important particular, from the principles under which we began our work nine years or more ago. On the other hand, every year shows us that improvements can be made in the methods of administration and in the arrangements for the education of youth. As our numbers increase, more regulations are called for, and more care is requisite lest the teachers lose that personal acquaintance with the students which has hitherto been an excellent feature of our intercourse. I believe that every member of the academic staff is animated by a desire to be of

the utmost possible service to the pupils who are under his charge, and at the same time to make some positive contribution, even though it be not large, to the science he professes. I believe that our students are distinguished for their enthusiasm, their diligence, and their aspirations for that which is of good report.

It is to many persons at a distance a source of regret that the differences of opinion which separate into so many denominations the religious world, prevent our assuming any religious name, or wearing any ecclesiastical badge; but on the other hand it is a source of general satisfaction that here so many of those who are elsewhere separated can be united in the search after truth, and in the maintenance of faith. I believe that in the providence of God, this foundation is to be most useful in the development of character, and in teaching successive generations of young men to live uprightly. When this university began the Trustees expressed their wish that it should be free from sectarian bias, but should be pervaded by the spirit of enlightened Christianity. With a reiteration of that wish I close this ninth report.

DANIEL C. GILMAN,

President of the Johns Hopkins University.

BALTIMORE, November 3, 1884.

APPENDIX.

A.

Professors, Associates, Etc., 1876-84.

The names in each group are arranged in the order of appointment. The column of dates indicates the period during which the particular station referred to has been held. In consequence of promotions some names appear in several groups.

PRESIDENT.

DANIEL C. GILMAN, 1875-

PROFESSORS.

BASIL L. GILDERSLEEVE, *Greek*, 1876-
 J. J. SYLVESTER, . . . *Mathematics*, 1876-1884.
 IRA REMSEN, *Chemistry*, 1876-
 HENRY A. ROWLAND, . . . *Physics*, 1876-
 H. NEWELL MARTIN, . . . *Biology*, 1876-
 CHARLES D. MORRIS, . . . *Classics, (Collegiate)*, 1876-
 PAUL HAUPT, *Shemitic Languages*, 1883-
 G. STANLEY HALL, . . . *Psychology*, 1884-
 WILLIAM H. WELCH, . . . *Pathology*, 1884-
 SIMON NEWCOMB, . . . *Mathematics & Astronomy*, 1884-

ASSOCIATE PROFESSORS.

HERBERT B. ADAMS, . . . *History*, 1883-
 MAURICE BLOOMFIELD, . . . *Sanskrit*, 1883-
 WILLIAM K. BROOKS, . . . *Morphology*, 1883-
 THOMAS CRAIG, *Applied Mathematics*, 1883-
 CHARLES S. HASTINGS, . . . *Physics*, 1883-1884.
 HARMON N. MORSE, . . . *Chemistry*, 1883-
 WILLIAM E. STORY, . . . *Mathematics*, 1883-
 MINTON WARREN, *Latin*, 1883-
 A. MARSHALL ELLIOTT, . . . *Romance Languages*, 1884-
 J. RENDEL HARRIS, . . . *New Testament Greek*, 1884-

ASSOCIATES.

JOHN M. CROSS,	. . . <i>Greek,</i>	. . . . .	. 1876-1881.
PHILIP R. UHLER,	. . . <i>Natural History,</i>	. . . . .	. 1876-
AUSTIN SOOTT,	. . . <i>History,</i>	. . . . .	. 1876-1882.
A. MARSHALL ELLIOTT,	. . . <i>Romance Philology,</i>	. . . . .	. 1876-1884.
THOMAS C. MURRAY,	. . . <i>Shemitic,</i>	. . . . .	. 1876-1879.
HERMAN C. G. BRANDT,	. . . <i>German,</i>	. . . . .	. 1876-1882.
WILLIAM K. BROOKS,	. . . <i>Biology,</i>	. . . . .	. 1876-1883.
HARMON N. MORSE,	. . . <i>Chemistry,</i>	. . . . .	. 1876-1883.
ROBERT RIDGWAY,	. . . <i>Natural History,</i>	. . . . .	. 1876-1877.
WILLIAM E. STORY,	. . . <i>Mathematics,</i>	. . . . .	. 1876-1883.
ARTHUR W. TYLER,	. . . <i>Librarian,</i>	. . . . .	. 1876-1878.
CHARLES S. HASTINGS,	. . . <i>Physics,</i>	. . . . .	. 1876-1883.
CHARLES R. LANMAN,	. . . <i>Sanskrit,</i>	. . . . .	. 1877-1880.
HERBERT B. ADAMS,	. . . <i>History,</i>	. . . . .	. 1878-1883.
ALBERT S. COOK,	. . . <i>English,</i>	. . . . .	. 1879-1881.
MINTON WARREN,	. . . <i>Latin,</i>	. . . . .	. 1879-1883.
WILLIAM HAND BROWNE,	. . . <i>Librarian,</i>	. . . . .	. 1879-
HENRY SEWALL,	. . . <i>Biology,</i>	. . . . .	. 1880-1882.
THOMAS CRAIG,	. . . <i>Mathematics,</i>	. . . . .	. 1880-1883.
MAURICE BLOOMFIELD,	. . . <i>Sanskrit,</i>	. . . . .	. 1881-1883.
WILLIAM T. SEDGWICK,	. . . <i>Biology,</i>	. . . . .	. 1881-1883.
HENRY WOOD,	. . . <i>English,</i>	. . . . .	. 1881-1884.
FABIAN FRANKLIN,	. . . <i>Mathematics,</i>	. . . . .	. 1882-
RICHARD T. ELY,	. . . <i>Political Economy,</i>	. . . . .	. 1882-
J. FRANKLIN JAMESON,	. . . <i>History,</i>	. . . . .	. 1883-
GEORGE H. WILLIAMS,	. . . <i>Mineralogy,</i>	. . . . .	. 1883-
EDWARD M. HARTWELL,	. . . <i>Physical Training,</i>	. . . . .	. 1884-
HENRY WOOD,	. . . <i>German,</i>	. . . . .	. 1884-
ARTHUR L. KIMBALL,	. . . <i>Physics,</i>	. . . . .	. 1884-
WILLIAM T. COUNCILMAN,	. . . <i>Pathology,</i>	. . . . .	. 1884-

LECTURERS.

Most of the persons named as lecturers have given courses of from six to twenty lectures. A few of them have given much longer courses, extending through half the year or through the entire year. In three cases, only single lectures have been given.

SIMON NEWCOMB,	. . . <i>Astronomy,</i>	. . . . .	. 1876.
LÉONCE RABILLON,	. . . <i>French,</i>	. . . . .	. 1876-
JOHN S. BILLINGS,	. . . <i>Medical History, etc.,</i>	. . . . .	. 1877.

FRANCIS J. CHILD, .	. <i>Chaucer, Ballads, etc.,</i>	. 1877-1878.
THOMAS M. COOLEY, .	. <i>Law,</i>	. 1877-1879.
JULIUS E. HILGARD, .	. <i>Geodetic Surveys,</i>	. 1877.
JAMES RUSSELL LOWELL, .	. <i>Romance Literature,</i>	. 1877.
JOHN W. MALLET, .	. <i>Technological Chemistry,</i>	1877-1878.
FRANCIS A. WALKER, .	. <i>Political Economy,</i>	. 1877-1878. .
WILLIAM D. WHITNEY, .	. <i>Comparative Philology,</i>	. 1877.
WILLIAM F. ALLEN, .	. <i>History,</i>	. 1878.
WILLIAM JAMES, .	. <i>Psychology,</i>	. 1878.
GEORGE S. MORRIS, .	. <i>Philosophy,</i>	. 1878-
J. LEWIS DIMAN, .	. <i>History,</i>	. 1879.
H. VON HOLST, .	. <i>History,</i>	. 1879.
WILLIAM G. FARLOW, .	. <i>Botany,</i>	. 1879.
J. WILLARD GIBBS, .	. <i>Theoretical Mechanics,</i>	. 1879.
SIDNEY LANIER, .	. <i>English Literature,</i>	. 1879-1881.
CHARLES S. PEIRCE, .	. <i>Logic,</i>	. 1879-1884.
JOHN TROWBRIDGE, .	. <i>Physics,</i>	. 1880.
A. GRAHAM BELL, .	. <i>Phonology,</i>	. 1881.
S. P. LANGLEY, .	. <i>Physics,</i>	. 1881.
JOHN MCCREADY, .	. <i>Biology,</i>	. 1881.
JAMES BRYCE, .	. <i>Political Science,</i>	. 1881.
EDWARD A. FREEMAN, .	. <i>History,</i>	. 1881.
JOHN J. KNOX, .	. <i>Banking,</i>	. 1881.
ARTHUR CAYLEY, .	. <i>Mathematics,</i>	. 1882.
WILLIAM W. GOODWIN, .	. <i>Plato,</i>	. 1882.
G. STANLEY HALL, .	. <i>Psychology,</i>	. 1882-1884.
RICHARD M. VENABLE, .	. <i>Constitutional Law,</i>	. 1882.
JAMES A. HARRISON, .	. <i>Anglo-Saxon,</i>	. 1882.
J. RENDEL HARRIS, .	. <i>New Testament Greek,</i>	. 1882-1884.
GEORGE W. CABLE, .	. <i>English Literature,</i>	. 1883.
WILLIAM W. STORY, .	. <i>Michel Angelo,</i>	. 1883.
HIRAM CORSON, .	. <i>English Literature,</i>	. 1883-
F. SEYMOUR HADEN, .	. <i>Etchers and Etching,</i>	. 1883.
JOHN S. BILLINGS, .	. <i>Municipal Hygiene,</i>	. 1883.
JAMES BRYCE, .	. <i>Roman Law,</i>	. 1883.
H. VON HOLST, .	. <i>Political Science,</i>	. 1883.
WILLIAM TRELEASE, .	. <i>Botany,</i>	. 1884.
J. THACHER CLARKE, .	. <i>Explorations in Assos,</i>	. 1884.
JOSIAH ROYCE, .	. <i>Philosophy,</i>	. 1884.

WILLIAM J. STILLMAN,	. <i>Archæology,</i>	. . .	. 1884.
CHARLES WALDSTEIN,	. <i>Archæology,</i>	. . .	. 1884.
SIR WILLIAM THOMSON,	. <i>Molecular Dynamics,</i>	. . .	. 1884.

INSTRUCTORS AND ASSISTANTS.

HENRY SEWALL,	. . . <i>Biology,</i>	. . .	. 1876-1878.
SAMUEL F. CLARKE,	. . . <i>Biology,</i>	. . .	. 1879-1881.
FABIAN FRANKLIN,	. . . <i>Mathematics,</i>	. . .	. 1879-1882.
LYMAN B. HALL,	. . . <i>Chemistry,</i>	. . .	. 1879-1880.
CHRISTIAN SIHLER,	. . . <i>Biology,</i>	. . .	. 1879-1880.
HENRY C. ADAMS,	. . . <i>Political Economy,</i>	. . .	. 1879-1881.
THOMAS CRAIG,	. . . <i>Mathematics,</i>	. . .	. 1879-1880.
CHAS. L. WOODWORTH, JR.	. . . <i>Elocution,</i>	. . .	. 1879-
WILLIAM T. SEDGWICK,	. . . <i>Biology,</i>	. . .	. 1880-1881.
EDWIN H. HALL,	. . . <i>Physics,</i>	. . .	. 1880-1881.
GEORGE H. STOCKBRIDGE,	. . . <i>Latin and German,</i>	. . .	. 1880-1881.
PHILIPPE B. MARCOU,	. . . <i>French,</i>	. . .	. 1880-1883.
HUGH NEWELL,	. . . <i>Drawing,</i>	. . .	. 1880-
R. DORSEY COALE,	. . . <i>Chemistry,</i>	. . .	. 1881-1883.
RICHARD T. ELY,	. . . <i>Political Economy,</i>	. . .	. 1881-1882.
LAWRENCE B. FLETCHER,	. . . <i>Physics,</i>	. . .	. 1881.
GEORGE F. NICOLASSEN,	. . . <i>Greek and Latin,</i>	. . .	. 1881-1882.
BENJAMIN E. SMITH,	. . . <i>Philosophy,</i>	. . .	. 1881-1882.
EDMUND B. WILSON,	. . . <i>Biology,</i>	. . .	. 1881-1882.
JAMES W. BRIGHT,	. . . <i>German,</i>	. . .	. 1882-1883.
J. FRANKLIN JAMESON,	. . . <i>History,</i>	. . .	. 1882-1883.
EDWARD H. SPIEKER,	. . . <i>Greek and Latin,</i>	. . .	. 1882-
HARRY F. REID,	. . . <i>Physics,</i>	. . .	. 1882-1884.
CHARLES F. RADDATZ,	. . . <i>German,</i>	. . .	. 1882-1884.
EDWARD M. HARTWELL,	. . . <i>Physical Training,</i>	. . .	. 1883-1884.
HERBERT W. CONN,	. . . <i>Osteology,</i>	. . .	. 1883-1884.
G. THEODORE DIPPOLD,	. . . <i>German,</i>	. . .	. 1883-1884.
HENRY H. DONALDSON,	. . . <i>Animal Physiology,</i>	. . .	. 1883-1884.
HENRY A. TODD,	. . . <i>Romance Languages,</i>	. . .	. 1883-
OTTO LUGGER,	. . . <i>Curator of Biol. Museum,</i>	. . .	. 1883-
CHARLES A. PERKINS,	. . . <i>Physics,</i>	. . .	. 1884-
WILLIAM H. HOWELL,	. . . <i>Biology,</i>	. . .	. 1884-
EDWARD H. KEISER,	. . . <i>Chemistry,</i>	. . .	. 1884-

B.

Roll of Fellows.

The following list gives the names of all persons who have been selected by the authorities and appointed to fellowships. Though, in a few cases, by reason of promotion or other causes, the persons designated have not entered upon the fellowships, their names are given to exhibit fully the working of this system of appointment.

The present position or residence of the former holders of fellowships is, in most cases, given after the name.

-
- HENRY C. ADAMS, PH. D., *Political Science*, 1876-1879.
Associate Professor of Political Economy, Cornell University; Lecturer on Political Economy, University of Michigan.
- HERBERT B. ADAMS, PH. D., *History*, 1876-1878.
Associate Professor of History, Johns Hopkins University.
- WILLIAM K. BROOKS, PH. D., *Biology*, 1876.
Associate Professor of Morphology, and Director of Chesapeake Zoological Laboratory, Johns Hopkins University. (*Appointed Associate before entering on the Fellowship*).
- THOMAS CRAIG, PH. D., *Mathematics*, 1876-1879.
Associate Professor of Applied Mathematics, Johns Hopkins University.
- JOSHUA W. GORE, C. E., *Mathematics*, 1876-1878.
Professor of Natural Philosophy and Engineering, University of North Carolina.
- GEORGE B. HALSTED, PH. D., *Mathematics*, 1876-1878.
Professor of Mathematics, University of Texas.
- EDWARD HART, PH. D., *Chemistry*, 1876-1878.
Assistant Professor of Chemistry, Lafayette College.
- DANIEL W. HERING, C. E., *Engineering*, 1876-1878.
Professor of Mathematics, Western University of Pennsylvania.
- MALVERN W. ILES, PH. D., *Chemistry*, 1876-1878.
Chemist, Leadville, Colorado.
- WILLIAM W. JACQUES, PH. D., *Physics*, 1876-1879.
Instructor in Telegraph Engineering, Massachusetts Institute of Technology.
- CHARLES R. LANMAN, PH. D., *Sanskrit*, 1876-1877.
Professor of Sanskrit, Harvard University.
- D. MCGREGOR MEANS, A. B., *Political Science*, 1876-1877.
Late Professor of Political and Mental Science, Middlebury College; Attorney at Law, New York City.
- HARMON N. MORSE, PH. D., *Chemistry*, 1876.
Associate Professor of Chemistry, Johns Hopkins University. (*Appointed Associate before entering upon the Fellowship*).
- WALTER H. PAGE, *Greek*, 1876-1878.
Late Professor in the Louisville (Ky.) High School.
- P. PORTER POINTER, M. E., *Physics*, 1876.
(*Died without entering upon the Fellowship, June, 1876, aged 23 years*).
- E. DARWIN PRESTON, C. E., *Engineering*, 1876-1878.
U. S. Coast and Geodetic Survey; National Observatory, Cordoba, Argentine Republic.

- HENRY J. RICE, SC. D., *Biology*, 1876-1878.
Professor of Natural Sciences, Brooklyn (N. Y.) High School.
- JOSIAH ROYCE, PH. D., *Philosophy*, 1876-1878.
Instructor in Philosophy, Harvard University.
- ERNEST G. SIHLER, PH. D., *Greek*, 1876-1879.
Classical Instructor, New York City.
- FREDERICK B. VAN VORST, A. B., . . . *Ethics and Metaphysics*, 1876-1877.
Attorney at Law, New York City.
- JOHN H. WHEELER, PH. D., *Philology*, 1876-1877.
Professor of Greek, University of Virginia.
- SAMUEL F. CLARKE, PH. D., *Biology*, 1876-1879.
Professor of Natural History, Williams College.
- LYMAN B. HALL, PH. D., *Chemistry*, 1877-1879.
Professor of Chemistry and Physics, Haverford College, Pa.
- A. DUNCAN SAVAGE, B. LITT., *Greek*, 1876-1879.
- FABIAN FRANKLIN, PH. D., *Mathematics*, 1877-1879.
Associate in Mathematics, Johns Hopkins University.
- CHRISTIAN SIHLER, PH. D., *Biology*, 1877-1879.
Physician, Cleveland, Ohio.
- FRANCIS G. ALLINSON, PH. D., *Greek and Sanskrit*, 1877-1880.
Assistant Professor of Greek and Latin, Haverford College, 1880-82; Classical Instructor, Baltimore.
- MAURICE BLOOMFIELD, PH. D., *Sanskrit and Greek*, 1878-1879.
Associate Professor of Sanskrit, Johns Hopkins University.
- CONSTANTINE FAHLBERG, PH. D., . . . *Chemistry*, 1878-1880.
Chemist, Gray's Ferry Chemical Works, Philadelphia.
- EDWIN H. HALL, PH. D., *Physics*, 1878-1880.
Instructor in Physics, Harvard University.
- EDWARD COLES HARDING, A. M., *Greek*, 1878-1879.
Professor of Greek, University of Louisiana, 1879-80.
- ISAAC OTT, M. D., *Biology*, 1878-1879.
Physician, Easton, Pa.
- HENRY SEWALL, PH. D., *Biology*, 1878-1879.
Professor of Physiology, University of Michigan.
- WASHINGTON I. STRINGHAM, PH. D., . . *Mathematics*, 1878-1880.
Professor of Mathematics, University of California.
- ABRAM V. E. YOUNG, PH. B., *Chemistry*, 1878-1880.
- CHARLES R. HEMPHILL, A. M., *Greek*, 1878-1879.
Associate Professor of Biblical Literature, Theological Seminary, Columbia, S. C.
- ALLAN MARQUAND, PH. D., *Logic and Ethics*, 1877-1880.
Professor of the History of Art, Princeton College.
- CHARLES A. VAN VELZER, S. B., *Mathematics*, 1878-1881.
Assistant Professor of Mathematics, University of Wisconsin.
- BROWN AYRES, S. B., *Physics*, 1879-1880.
Professor of Physics, Tulane University, New Orleans.
- LOUIS BEVIER, PH. D., *Greek*, 1879-1881.
Instructor in Rutgers College.
- EDWARD M. HARTWELL, PH. D., *Biology*, 1879-1881.
Associate in Physical Training, Johns Hopkins University.
- JOHN R. McD. IRBY, PH. D., *Mineralogy*, 1879-1880.
(Died March 25, 1880, aged 25 years).

- MITSURU KUHARA, PH. D.,** . . . *Chemistry,* . . . 1879-1881.
Lecturer on Organic Chemistry, University of Tokio, Japan.
- OSCAR H. MITCHELL, PH. D.,** . . . *Mathematics,* . . . 1879-1882.
Professor of Mathematics, Marietta College, Ohio.
- EDWARD L. NICHOLS, PH. D.,** . . . *Physics,* . . . 1879-1880.
Professor of Physics and Chemistry, University of Kansas.
- WALDO S. PRATT, A. M.,** . . . *Aesthetics, etc.,* . . . 1879-1880.
Instructor in Ecclesiastical Music, Theological Seminary, Hartford, Conn.
- WILLIAM T. SEDGWICK, PH. D.,** . . . *Biology,* . . . 1879-1880.
Assistant Professor of Biology, Massachusetts Institute of Technology.
- HERMANN VOORHEES, C. E.,** . . . *Chemistry,* . . . 1879.
(Died without entering on the Fellowship, October 14, 1879, aged 27 years).
- CHARLES O. WHITMAN, PH. D.,** . . . *Biology,* . . . 1879.
Professor of Zoology, University of Tokio, Japan, 1879-81; Marine Station, Naples, 1881-82. (Resigned before entering on the Fellowship).
- EDMUND B. WILSON, PH. D.,** . . . *Biology,* . . . 1879-1881.
Associate Professor (elect) of Biology, Bryn Mawr College, Pa.
- GEORGE F. NICOLASSEN, PH. D.,** . . . *Greek,* . . . 1879-1881.
Professor of Greek and Latin, Southwestern Presbyterian University, Tenn.
- WILLIAM BURNET, PH. D.,** . . . *Chemistry,* . . . 1879-1880.
Professor of Chemistry, South Carolina Agricultural College.
- ROBERT W. PRENTISS, S. B.,** . . . *Mathematics,* . . . 1879-1881.
Office of U. S. Nautical Almanac, Washington, D. C.
- JAMES W. BRIGHT, PH. D.,** . . . *Teutonic Languages,* . . . 1880-1882.
Fellow by Courtesy, Johns Hopkins University.
- BENJAMIN C. BURT, A. M.,** . . . *Philosophy,* . . . 1880-1881.
Assistant Professor of English and Rhetoric, University of Michigan.
- SPENCER H. FREEMAN, A. M.,** . . . *Physics,* . . . 1880-1882.
Professor of Physics and Astronomy, Adelbert College, Western Reserve University, Ohio.
- KAKICHI MITSUKURI, PH. D.,** . . . *Biology,* . . . 1880-1881.
Professor of Zoology, University of Tokio, Japan.
- BERNARD F. O'CONNOR, PH. D.,** . . . *Romance Languages,* . . . 1880-1882.
Instructor in French, Columbia College.
- CHASE PALMER, PH. D.,** . . . *Chemistry,* . . . 1880-1882.
Professor of Chemistry, Massachusetts State Normal School, Salem, 1882-84.
- HERBERT M. PERRY, A. B.,** . . . *Mathematics,* . . . 1880-1882.
Instructor in Mathematics, Cascadilla School, Ithaca, N. Y.
- WILLIAM L. ROWLAND, S. B.,** . . . *Chemistry,* . . . 1880.
(Did not enter upon the Fellowship).
- EDWARD H. SPIEKER, PH. D.,** . . . *Greek,* . . . 1880-1882.
Assistant in Greek and Latin, Johns Hopkins University.
- MORRISON I. SWIFT, A. B.,** . . . *Philosophy,* . . . 1880-1882.
Instructor in Logic and Political Economy, Hobart College, 1882-84; Fellow by Courtesy, Johns Hopkins University.
- ARTHUR W. WHEELER, A. B.,** . . . *Physics,* . . . 1880-1881.
(Died, January 6, 1881, aged 21 years).
- B. DORSEY COALE, PH. D.,** . . . *Chemistry,* . . . 1880-1881.
Professor of Chemistry and Toxicology, University of Maryland.
- A. F. WILHELM SCHIMPER, PH. D.,** . . . *Biology,* . . . 1880-1881.
University of Bonn, Germany.
- LAWRENCE B. FLETCHER, PH. D.,** . . . *Physics,* . . . 1880-1881.
Instructor in Physics, Wesleyan University, Middletown, Conn., 1882-83.

- WILLIAM J. ALEXANDER, PH. D., . . . *Greek*, 1881-1883.
Professor of English, Dalhousie College, Nova Scotia.
- EDWARD S. BURGESS, A. B., . . . *Greek*, 1881-1882.
Instructor, Washington (D. C.) High School.
- WILLIAM J. COMSTOCK, PH. B., . . . *Chemistry*, 1881-1882.
Student of Chemistry, University of Munich.
- WILLIAM C. DAY, PH. D., . . . *Chemistry*, 1881-1883.
Professor of Chemistry and Physics, University of Nashville, Tenn.
- HENRY H. DONALDSON, A. B., . . . *Biology*, 1881-1883.
Assistant in Biology, Johns Hopkins University, 1883-84; now Fellow by Courtesy.
- WILLIAM P. DUFFEE, PH. D., . . . *Mathematics*, 1881-1883.
Instructor in charge of the department of Mathematics, Hobart College.
- GEORGE S. ELY, PH. D., . . . *Mathematics*, 1881-1883.
Professor of Mathematics, Buchtel College, 1883-84; Examiner, U. S. Patent Office.
- J. FRANKLIN JAMESON, PH. D., . . . *History*, 1881-1882.
Associate in History, Johns Hopkins University.
- C. HERSCHEL KOYL, A. B., . . . *Physics*, 1881-1883.
- HENRY L. OSBORN, PH. D., . . . *Biology*, 1881-1882.
Instructor in Zoology, Purdue University, Lafayette, Indiana.
- HENRY N. STOKES, PH. D., . . . *Biology*, 1881-1883.
Student of Chemistry in Europe.
- BENJAMIN W. WELLS, PH. D., . . . *English*, 1881.
Instructor in English, Friends' School, Providence, R. I.
- BENJAMIN I. GILMAN, A. B., . . . *Logic*, 1881-1882.
Student in Harvard University.
- CHARLES J. BELL, A. B., . . . *Chemistry*, 1882.
Professor of Chemistry, Pennsylvania State College, Center Co., Pa. (*Did not enter upon the Fellowship*).
- JAMES M. CATTELL, A. B., . . . *Philosophy*, 1882-1883.
Student of Philosophy in Germany.
- ELLERY W. DAVIS, PH. D., . . . *Mathematics*, 1882-1884.
Professor of Mathematics and Military Tactics, Florida Agricultural College.
- DAVID T. DAY, PH. D., . . . *Chemistry*, 1882-1884.
- ALFRED EMERSON, PH. D., . . . *Greek*, 1882-1884.
Instructor in Classical Archaeology, Johns Hopkins University.
- WILLIAM S. FLEMING, A. B., . . . *Greek*, 1882-1883.
Professor of Greek and German, Davidson College.
- ARTHUR L. FROTHINGHAM, JR., PH. D., *Shemitic Languages*, . . . 1882-
- HENRY R. GOODNOW, A. B., . . . *Physics*, 1882-1883.
- ELGIN R. L. GOULD, A. B., . . . *History*, 1882-1884.
Instructor in History, Washington (D. C.) High School.
- ARTHUR S. HATHAWAY, S. B., . . . *Mathematics*, 1882-1884.
Fellow by Courtesy, Johns Hopkins University.
- WILLIAM H. HOWELL, PH. D., . . . *Biology*, 1882-1884.
Assistant in Biology, Johns Hopkins University.
- ARTHUR L. KIMBALL, PH. D., . . . *Physics*, 1882-1883.
Associate in Physics, Johns Hopkins University.
- HARRY F. REID, A. B., . . . *Physics*, 1882.
Student of Physics in Germany.

EDWARD H. KEISER, PH. D.,	<i>Chemistry,</i>	1882-1884.
Assistant in Chemistry, Johns Hopkins University.		
WILLIAM M. ARNOLT B. D.	<i>Greek,</i>	1883-
GUSTAV BISSING, A. B.,	<i>Mathematics,</i>	1883-1884.
Examiner, U. S. Patent Office.		
ADAM T. BRUCE, A. B.,	<i>Biology,</i>	1883-1884.
Johns Hopkins University.		
ARCHIBALD L. DANIELS, A. B.,	<i>Mathematics,</i>	1883-1884.
Instructor in Mathematics, Princeton College.		
JOHN DEWEY, PH. D.,	<i>Philosophy,</i>	1883-1884.
Instructor in Philosophy, University of Michigan.		
JAMES R. DUGGAN, PH. D.,	<i>Chemistry,</i>	1883-
HANS C. G. VON JAGEMANN, PH. D.,	<i>Modern Languages,</i>	1883-1884.
Professor of Modern Languages, Earlham College, Richmond, Ind.		
GUSTAV A. LIEBIG, JR., A. B.,	<i>Physics,</i>	1883-
C. W. EMIL MILLER, A. B.,	<i>Greek,</i>	1883-
CHARLES A. PERKINS, PH. D.,	<i>Physics,</i>	1883-1884.
Assistant in Physics, Johns Hopkins University.		
LEWIS T. STEVENS, A. B.,	<i>Biology,</i>	1883-1884.
Student of Medicine, Harvard University.		
LEWIS W. WILHELM, PH. D.,	<i>History,</i>	1883-1884.
Fellow by Courtesy, Johns Hopkins University.		
ETHAN A. ANDREWS, PH. B.,	<i>Biology,</i>	1884-
HENRY CREW, A. B.,	<i>Physics,</i>	1884-
HOMER W. HILLYER, S. B.,	<i>Chemistry,</i>	1884-
ABEL H. HUIZINGA, A. B.,	<i>Shemitic Languages,</i>	1884-
FREDERIC S. LEE, A. B.,	<i>Biology,</i>	1884-
CHARLES H. LEVERMORE, A. B.,	<i>History,</i>	1884-
HENRY F. NACHTRIEB, S. B.,	<i>Biology,</i>	1884-
HENRY B. NIXON,	<i>Mathematics,</i>	1884-
WILLIAM NOYES, JR.,	<i>Psychology,</i>	1884-
ALBERT G. PALMER, A. B.,	<i>Chemistry,</i>	1884-
ERNEST M. PEASE, A. B.,	<i>Latin,</i>	1884-
ALBERT H. TOLMAN, A. B.,	<i>English,</i>	1884.
Professor of English Literature and Rhetoric, in Ripon College, Wisc. (<i>Resigned before entering on the Fellowship</i>).		
WOODROW WILSON, A. B.,	<i>History,</i>	1884-

C. Graduates.

DEGREES CONFERRED HONORIS CAUSA.

1880.

HENRY A. ROWLAND, PH. D.
Professor of Physics, Johns Hopkins University.

1881.

RUTHERFORD B. HAYES, LL. D.
President of the United States.

DEGREES CONFERRED ON EXAMINATION.

1878.

DOCTORS OF PHILOSOPHY.

- HENRY CARTER ADAMS. (F).
A. B., Iowa, 1874.—Lecturer on Political Economy, University of Michigan; Associate Professor of Political Economy, Cornell University.
- THOMAS CRAIG. (F).
C. E., Lafayette, 1878.—Associate Professor of Mathematics, Johns Hopkins University.
- JOSIAH ROYCE. (F).
A. B., Univ. of California, 1875.—Instructor in Philosophy, Harvard University.
- ERNEST GOTTLIEB SIHLER. (F).
Concordia, 1869.—Classical Instructor, New York City. (4)

1879.

DOCTORS OF PHILOSOPHY.

- MAURICE BLOOMFIELD. (F).
A. M., Furman, 1877.—Associate Professor of Sanskrit, Johns Hopkins University.
- SAMUEL FESSENDEN CLARKE. (F).
Ph. B., Yale, 1878.—Professor of Natural History, Williams College.
- GEORGE BRUCE HALSTED. (F).
A. B., Princeton, 1875.—Professor of Mathematics, University of Texas.
- EDWARD HART. (F).
S. B., Lafayette, 1874.—Assistant Professor of Chemistry, Lafayette College.
- WILLIAM WHITE JACQUES. (F).
S. B., Mass. Inst. of Technology, 1876.—Instructor in Telegraph Engineering, Massachusetts Institute of Technology.
- HENRY SEWALL. (F).
S. B., Wesleyan, 1876.—Professor of Physiology, University of Michigan. (6)

F. Holders of Fellowships.

BACHELORS OF ARTS.

GEORGE WASHINGTON MCCREARY.

Engaged in mercantile pursuits, Baltimore.

CHASE PALMER. (F).

Professor of Chemistry, Massachusetts State Normal School, 1882-84.

EDWARD HENRY SPIEKER. (F).

Assistant in Greek and Latin, Johns Hopkins University.

(8)

1880.

DOCTORS OF PHILOSOPHY.

FRANCIS GREENLEAF ALLINSON. (F).

A. B., Haverford, 1876; A. B., Harvard, 1877.—Late Assistant Professor of Greek and Latin, Haverford College; Classical Instructor, Baltimore.

FABIAN FRANKLIN. (F).

Ph. B., Columbian, 1869.—Associate in Mathematics, Johns Hopkins University.

EDWIN HERBERT HALL. (F).

A. B., Bowdoin, 1875.—Instructor in Physics, Harvard University.

ALLAN MARQUAND. (F).

A. B., Princeton, 1874.—Professor of the History of Art, Princeton College.

WASHINGTON IRVING STRINGHAM. (F).

A. B., Harvard, 1877.—Professor of Mathematics, University of California.

(5)

BACHELORS OF ARTS.

THOMAS MILTON BEADENKOPF.

Student of Theology, Yale College.

ALLEN KERR BOND.

M. D., University of Maryland, 1882.—Physician, Baltimore.

WILLIAM CATHCART DAY. (F).

Professor of Chemistry and Physics, University of Nashville, Tenn.

HENRY LAURENCE GANTT.

M. E., Stevens Institute of Technology, 1884.—Mechanical Engineer, Baltimore.

EDGAR GOODMAN.

LL. B., University of Maryland, 1881.—Attorney at Law, Baltimore.

CARL ECKHARDT GRAMMER.

Minister of the Protestant Episcopal Church, Hancock, Md.

ALEXANDER FRIDGE JAMIESON.

Instructor, Trenton, N. J.

*EDMUND ALLEN JARVIS.

Died October 16, 1880, aged 22 years.

STEWART BRIAN LINTHICUM.

LL. B., University of Maryland, 1882.—Attorney at Law, Portland, Oregon.

JOHN HANSON LOWE.

LL. B., University of Maryland, 1882.—Attorney at Law, Baltimore.

LEIGH CLINTON MORGAN.

Minister of the Protestant Episcopal Church, Brooklyn, N. Y.

NELSON PALMER.

Baltimore.

THOMAS PETTIGREW.

Creswell, N. C.

HARRY FIELDING REID. (F).

Assistant in Physics, Johns Hopkins University, 1882-84.—Now Student of Physics in Berlin.

WILTZ RAYMOND STRICKLEN.

Minister of the Methodist Episcopal Church, Maryland.

LEWIS WEBB WILHELM. (F).

Johns Hopkins University.

(16)

1881.

DOCTORS OF PHILOSOPHY.

LOUIS BEVIER. (F).

A. B., Rutgers, 1878; Instructor in Rutgers College.

ROBERT DORSEY COALE. (F).

Professor of Chemistry and Toxicology, University of Maryland.

EDWARD ALLEN FAY.

A. B., University of Michigan, 1862.—Professor of History and Languages, National Deaf-Mute College.

LAWRENCE BUNTING FLETCHER. (F).

A. B., Columbia, 1877.—Instructor in Physics, Wesleyan University, 1882-84.

SAMUEL GARNER.

A. B., St. Johns, 1871.—Professor of Modern Languages, University of Indiana.

EDWARD MUSSEY HARTWELL. (F).

A. B., Amherst, 1873; M. D., Miami Medical College, 1882.—Associate in Physical Training, Johns Hopkins University.

WILLIAM THOMPSON SEDGWICK. (F).

Ph. B., Yale, 1877.—Assistant Professor of Biology, Massachusetts Institute of Technology.

CHRISTIAN SIHLER. (F).

Concordia, 1866.—Physician, Cleveland, O.

EDMUND BEECHER WILSON. (F).

Ph. B., Yale, 1878.—Lecturer on Biology, Williams College, 1883-84; Associate Professor (elect) of Biology, Bryn Mawr College. (9)

BACHELORS OF ARTS.

WILLIAM WILSON BADEN.

LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

HENRY JOHNS BOWDOIN.

LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

JOHN WILSON BROWN.

Baltimore.

DAVID TALBOTT DAY. (F).

Johns Hopkins University.

WILLIAM HENRY HOWELL. (F).

Assistant in Biology, Johns Hopkins University.

JOHN JOHNSON.

Instructor, McDonogh School.

JAMES EDWARD KEELER.

Assistant, Allegheny (Pa.) Astronomical Observatory.

EDWIN GEORGE RICHARDSON.

Clergyman of the Protestant Episcopal Church, Newark, N. J.

ADONIRAM JUDSON ROBINSON.

Instructor in Baltimore City College.

HENRY ROLANDO.

M. D., University of Maryland, 1883.—Now connected with Presbyterian Hospital, New York City.

LEE SALE.

Student of Law, St. Louis, Mo.

MACTIER WARFIELD.

M. D., University of Maryland, 1884.—Physician, Baltimore.

(12)

1882.

DOCTORS OF PHILOSOPHY.

JAMES WILSON BRIGHT. (F).

A. B., Lafayette, 1877.—Fellow by Courtesy, Johns Hopkins University.

JOHN FRANKLIN JAMESON. (F).

A. B., Amherst, 1879.—Associate in History, Johns Hopkins University.

MITSURU KUHARA. (F).

S. B., University of Tokio, 1877.—Lecturer on Organic Chemistry, University of Tokio.

ROBERT W. MAHON.

C. E., Lehigh, 1876.—Adjunct Professor of Chemistry, Lafayette College.

OSCAR HOWARD MITCHELL. (F).

A. B., Marietta, 1876.—Professor of Mathematics, Marietta College.

GEORGE FREDERICK NICOLASSEN. (F).

A. B., University of Virginia, 1879.—Professor of Ancient Languages, Southwestern Presbyterian University.

WILLIAM ALBERT NOYES.

A. B., Iowa, 1879.—Professor of Chemistry, University of Tennessee.

CHASE PALMER. (F).

A. B., Johns Hopkins, 1879.—Professor of Chemistry, Mass. State Normal School, 1882-84.

EDWARD HENRY SPIEKER. (F).

A. B., Johns Hopkins, 1879.—Assistant in Greek and Latin, Johns Hopkins University. (9)

BACHELORS OF ARTS.

WILLIAM HUGHLETT ADKINS.

LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

THOMAS ALEXIS BERRY.

Graduate Student, Johns Hopkins University.

GUSTAV BISSING. (F).

Fellow, Johns Hopkins University, 1883-84.—Examiner, U. S. Patent Office.

WALTER BERNARD CLARKSON.

Principal of the Duval High School, Jacksonville, Fla.

HERMANN LOUIS EBELING.

Instructor, Bloomfield, N. J.

LOUIS GARTHE.

Baltimore.

EDWARD INGLE.

Graduate Student, Johns Hopkins University.

RICHARD FULLER KIMBALL.

LL. B., University of Maryland, 1884 —Attorney at Law, Baltimore.

GUSTAV ADOLPH LIEBIG, JR. (F).

Fellow, Johns Hopkins University.

CHARLES WILLIAM EMIL MILLER. (F).
Fellow, Johns Hopkins University.

JAMES PAGE.
Student, Mass. Institute of Technology.

ALBERT GALLATIN PALMER. (F).
Fellow, Johns Hopkins University.

ROBERT MILLER REESE.
Baltimore.

LEWIS TEBBETTS STEVENS. (F).
Student of Medicine, Harvard University.

HERBERT THORNDYKE TIFFANY.
Student of Law, Baltimore.

(15)

1883.

DOCTORS OF PHILOSOPHY.

WILLIAM JOHN ALEXANDER. (F).
A. B., University of London, 1876.—Professor of English Literature, Dalhousie College, Nova Scotia.

WILLIAM CATHCART DAY. (F).
A. B., Johns Hopkins University, 1880.—Professor of Chemistry and Physics, University of Nashville, Tennessee.

WILLIAM PITT DUFFEE. (F).
A. B., University of Michigan, 1876.—Instructor in Mathematics, Hobart College.

GEORGE STETSON ELY. (F).
A. B., Amherst College, 1878; Professor of Mathematics, Buchtel College, 1883-84.—Examiner, U. S. Patent Office.

KAKICHI MITSUKURI. (F).
Ph. B., Yale College, 1879.—Professor of Zoölogy, University of Tokio, Japan.

BERNARD FRANCIS O'CONNOR. (F).
Bach. de Lettres, Université de France, 1874.—Instructor in French, Columbia College.

(6)

BACHELORS OF ARTS.

WILLIAM SHIRLEY BAYLEY.
Graduate Scholar, Johns Hopkins University.

MAURICE FELS.
Student of Law, Philadelphia.

DAVID STERRETT GITTINGS.
Student of Law, Baltimore.

WILLIAM BEATTY HARLAN.
Student of Law, University of Maryland.

GEORGE THEOPHILUS KEMP.
Graduate Scholar, Johns Hopkins University.

GONZALEZ LODGE.
Graduate Scholar, Johns Hopkins University.

WILLIAM EDGAR STRATTON.
Student of Medicine, Harvard University.

HENRY WINSLOW WILLIAMS.
Student of Law, Baltimore.

HENRY VANPETERS WILSON.
Baltimore.

WILLIAM JOHN WITZENBACHER.
Instructor in the McDonogh School.

(10)

1884.

DOCTORS OF PHILOSOPHY.

- HERBERT WILLIAM CONN.**
A. B., Boston University, 1881.—Professor of Zoölogy, Wesleyan University, Conn.
- ELLERY WILLIAM DAVIS.** (F).
S. B., University of Wisconsin, 1879.—Professor of Mathematics and Military Tactics, Florida Agricultural College.
- DAVID TALBOTT DAY.** (F).
A. B., Johns Hopkins, 1881.
- JOHN DEWEY.** (F).
A. B., University of Vermont, 1879.—Instructor in Philosophy, University of Michigan.
- JAMES REYNOLDS DUGGAN.** (F).
A. B., Mercer University, 1877.—Fellow in Chemistry, Johns Hopkins University.
- WILLIAM HENRY HOWELL.** (F).
A. B., Johns Hopkins, 1881.—Assistant in Biology, Johns Hopkins University.
- HANS CARL GÜNTHER VON JAGEMANN.** (F).
Naumburg Gymnasium, 1876.—Professor of Modern Languages, Earlham College.
- EDWARD HARRISON KEISER.** (F).
S. B., Swarthmore, 1880.—Assistant in Chemistry, Johns Hopkins University.
- ARTHUR LALANDE KIMBALL.** (F).
A. B., Princeton, 1881.—Associate in Physics, Johns Hopkins University.
- HENRY LESLIE OSBORN.** (F).
A. B., Wesleyan, 1878.—Instructor in Zoölogy, Purdue University, Indiana.
- CHARLES ALBERT PERKINS.** (F).
A. B., Williams, 1879.—Assistant in Physics, Johns Hopkins University.
- ALBERT SHAW.**
A. B., Iowa College, 1879.—Journalist, Minneapolis, Minnesota.
- HENRY NEWLIN STOKES.** (F).
S. B., Haverford, 1879.—Student of Chemistry in Europe.
- LEWIS WEBB WILHELM.** (F).
A. B., Johns Hopkins, 1880.—Fellow by Courtesy, Johns Hopkins University.
- ARTHUR YAGER.**
A. B., Georgetown College, Kentucky, 1879.—Professor of History, Georgetown College, Ky. (15)

BACHELORS OF ARTS.

- ALBERT CLAYTON APPLEGARTH.**
Graduate Student, Johns Hopkins University.
- CHARLES WALTER ARTZ.**
Student of Law, Columbia College.
- WALTER BLISS CANFIELD.**
Graduate Student, Johns Hopkins University.
- GEORGE GIBSON CAREY, JR.**
Student of Law, University of Maryland.
- WILLIAM KENNEDY CROMWELL.**
Student of Law, Harvard University.
- CHARLES WILLIAM RAMMELSBURG CRUM.**
Instructor in Mathematics, Mercersburg College, Pa.
- HARRY FRIEDENWALD.**
Student of Medicine, College of Physicians and Surgeons, Baltimore.

- WILLIAM LINDSAY GLENN.
Graduate Scholar, Johns Hopkins University.
- JOHN HINKLEY.
Student of Law, University of Maryland.
- CHARLES HOWARD HOWARD.
Graduate Student, Johns Hopkins University.
- JOHN DEERING LORD, JR.
Student of Law, Columbia College.
- JERE WILLIAMS LORD.
Student of Medicine, University of Pennsylvania.
- WILLIAM PATRICK LYONS.
Student of Law, University of Maryland.
- EDGAR GEORGE MILLER, JR.
Graduate Student, Johns Hopkins University.
- WILLIAM RIDGELY ORNDORFF.
Graduate Student, Johns Hopkins University.
- GEORGE DOBBIN PENNIMAN.
Student of Law, University of Maryland.
- WILLIAM H. PERKINS, JR.
Graduate Student, Johns Hopkins University.
- GEORGE CLEMENT STOKES, JR.
Graduate Student, Johns Hopkins University.
- WILLIAM JONES THOMAS.
Professor of Mathematics, Western Maryland College.
- WILLIAM FERDINAND WALZ.
Graduate Student, Johns Hopkins University.
- FREDERICK HENRY WILKENS.
Student in the University of Berlin, Germany.
- GEORGE WISHART EDMOND, (*extra ordinem*).
Graduate Student, Johns Hopkins University.
- CHARLES HOWARD SHINN, (*extra ordinem*).
New York City.

(23)

TOTAL (1878-84).

DOCTORS OF PHILOSOPHY,	54
BACHELORS OF ARTS,	79

D.

Report of the Chesapeake Zoological Laboratory.

SESSION OF 1884.

To the President of the Johns Hopkins University:

SIR: I take pleasure in handing to you, at your request, the report of the seventh annual session of the marine laboratory of the University.

The laboratory was open for research, at Beaufort, North Carolina, from June 1st to September 19th, and its facilities were used by the following naturalists:

W. K. Brooks, *Director.*
H. W. Conn, *Assistant in charge.*
E. A. Andrews, *Fellow J. H. U.*
Wm. Bateson, *University of Cambridge, England.*
H. H. Donaldson, *J. H. U.*
E. A. Hartwell, *Teacher, Fitchburg, Mass.*
G. F. Kemp, *J. H. U.*
J. Nelson, *J. H. U.*
H. F. Nachtrieb, *Fellow J. H. U.*
H. L. Osborn, *Instructor in Zoology, Purdue University, Lafayette, Ind.*

Owing to the illness of the director he was able to spend only one month at the laboratory, and it was, for two months, in charge of H. W. Conn, Ph. D., Professor of Zoölogy at the Wesleyan University, Middletown, Conn.

Our experiment, of a year since, in the Chesapeake Bay, has demonstrated that Beaufort is the best available locality for our work, and our outfit was accordingly moved back from Hampton to Beaufort, in June, and the house which we had occupied in 1880-81 and '82 was again rented for occupation as a laboratory. The expenses of removal, together with the illness of the director, compelled us to make our season much shorter than usual, and the laboratory was occupied for only fifteen weeks.

The building at Beaufort furnishes accommodations for only six persons, and as our party of ten crowded it so much as to hamper our work I was compelled to refuse several applicants.

The following subjects among others were studied by the members of the party: The embryology of Echinoderms; the systematic zoölogy and anatomy and embryology of Annelids; the embryology of Medusae.

Dr. Conn has completed his work on the development of *Thalassema*, and his paper is ready for publication. He has also made many additions to a subject upon which he has been engaged for three years past,—a mono-

graph upon the Crabs of Beaufort. This work is now nearly completed and ready for publication, and will form a large volume with about twenty-five quarto plates. He has also studied the development of *Serpula*, and an abstract of his observations is now in press. The most important points are that the blastopore elongates and closes in such a manner that one extremity becomes the mouth and the other the anus, while the closed lips form the ventral surface. Mr. Conn has also prepared a paper on larval forms, which is to appear in the *Studies from the Biological Laboratory*.

Dr. Donaldson was occupied for three months in the study of the physiology of marine invertebrates. He made many experiments to determine the relative susceptibility of the different classes of invertebrates to poisons of vegetable origin. He also carried on a series of experiments to determine whether the current theory of digestion in the Actinozoa is correct. These experiments failed to support the theory.

The results of Mr. Bateson's work upon *Balanoglossus* last year, were published in England last winter, and were regarded as of such importance that a grant of money was given by the Royal Society, to enable him to return to Beaufort this season and complete them. His more recent researches seem to show that *Balanoglossus* presents many features of relationship to the Echinoderms and also many points of resemblance to the Vertebrates. An abstract of his conclusions was read at the Montreal meeting of the British Association.

Dr. Osborn has studied the embryology of *Fulgur* and *Neptunia*, and a short abstract of his results is now in press. A longer illustrated paper will be ready for publication this winter. His results show that the gill of *Neptunia* arises as a series of perfectly simple folds, upon the *outer surface* of the animal, and before the mantle cavity is formed, and as the mantle cavity is formed these folds are carried into it. He believes that this is the primitive condition of the gills of Gasteropods, and that the formation of a "ctenidium" is secondary. He has also studied the origin of the body cavity and reproductive organs of Gasteropods.

The early stages of Teleosts, and of *Limulus* have also been studied.

I have made many additions to my notes on the Medusae of Beaufort, and my monograph upon this subject, upon which I have been engaged for five years, is now sufficiently advanced for publication, as soon as a publisher can be found. It will form a large volume, with about thirty quarto plates.

I have now in press an abstract of my observations, made this summer upon the embryology of *Eutimia*. The following are some of the more important points. Delamination takes place over the whole inner surface of the blastoderm, and the digestive cavity is not obliterated. After the endoderm has been formed, the ectoderm becomes deeply invaginated, to form the adhesive gland of the planula. The planula does not become converted into a hydranth, but becomes a root, from which hydranths are formed by budding.

An illustrated paper upon the embryology of *Eutimia* and *Liriope* is now in preparation for the *Studies from the Biological Laboratory*, and it will be ready for publication this winter.

I was also able this summer to make a few observations upon the metamorphosis of Stomatopods, and these will be incorporated in my report on the Stomatopods of the Challenger Expedition, which will be ready for the press in March, 1885.

I have also in preparation, a paper, based on observations made this summer, on the origin of alternation in hydroids. This will be ready for publication in the *Studies* this winter, and I shall give facts which I believe to show that in this group, alternation has not originated through polymorphism, or division of labor, but through the asexual multiplication of immature larvae.

The following papers, based upon researches which are carried on at the marine laboratory have appeared since my last report, and five or six other papers are now in press, and will appear immediately.

On the Gill in some forms of Prosobranchiate Molluscs, by H. L. Osborn. *Studies from the Biological Laboratory*, vol. iii, no. 1, with three plates.

Life History of *Thalassema*, (abstract), by H. W. Conn. *Studies from the Biological Laboratory*, vol. iii, no. 1, with one plate.

The Significance of the Larval Skin of Decapods, by H. W. Conn. *Studies from the Biological Laboratory*, vol. iii, no. 1, with two plates.

On the Osteology of *Syngnathus Peckeanus*, by J. P. McMurrich. *University Circulars*, iii, 27.

An Instance of Sexual Variation in Crustacea, by H. W. Conn. *University Circulars*, iii, 27.

Abstract of Observations on the Development of *Balanoglossus*, by Wm. Bateson. *University Circulars*, iii, 27.

On the Osteology and Development of *Syngnathus Peckeanus*, by J. Playfair McMurrich. *Quart. Journ. Mic. Sc.*, vol. 23, (October,) 623-650, with two plates.

Upon the Ears of Fishes, with reference to the Function of Equilibrium, by H. Sewall. *Journal of Physiology*, iv, 339.

The Early Stages in the Development of *Balanoglossus*, by Wm. Bateson. *Quart. Journ. Mic. Science*, no. xciv, 208, with four plates.

Dr. H. J. Rice, a former Fellow of the University, writes that he has, in a pond at Cold Spring Harbor, a fine set of young oysters, which he has reared from the egg by methods which were first made known at the laboratory.

Respectfully,

W. K. BROOKS,

Director, Chesapeake Zoölogical Laboratory.

BALTIMORE, November, 1884.

E.

Report on the Work in Archæology.

To the President of the Johns Hopkins University:

SIR: In accordance with your request that I would prepare a connected statement of what has been done during the past year in this University to encourage the study of Archæology, I send you the following report:—

A course of public lectures on Classical Archæology was given in Hopkins Hall during the spring months. The opening lecture, (January 14), by Dr. Waldstein, director of the Fitzwilliam Museum at Cambridge, (England), treated of the Influence of Athletic Games on Greek Art, from the time of its transition from the archaic stage to a closer study of the human form, until finally professional athleticism signalled a decline in the standard of taste and of art.

Mr. Joseph T. Clarke, who was in charge of the American archæological expedition to Assos, began his course (March 10) with a Plea for Practical Archæology, showing how the practical work accomplished in the present century has raised this study to the rank of a science; whereas, in the past, the immense material at hand could not be put to its proper use from the want of critical spirit. His two following lectures (March 12 and 14) were devoted to an account of the city of Assos, as disclosed by the excavations carried on for more than two years by the Archæological Institute. Besides the well known temple, with its interesting reliefs, the buildings of the Agora or market-place are unique for the insight they give us into the Greek methods of construction. They comprise the immense Stoa, the Bouleuterion, and the Bath. The series is completed by the Theatre, the Gymnasium, and the interesting street of tombs. The concluding lecture (March 17) on the Cyrenaica showed the exceptional advantages which would attend excavations in this early Greek colony, as yet almost unexplored. The city of Cyrene, with its extensive ruins above ground, offers peculiar attractions to the explorer.

Mr. W. J. Stillman, late U. S. Consul in Crete, lectured on March 19, 21 and 24. Prehistoric Research in the Classical Field formed the subject of his first lecture. He expressed the view that the ruins in Italy and Greece, that are commonly called Cyclopean or Pelasgic, were the work of a Pelasgic civilization which, having its seat in lower or central Italy moved southward leaving traces of its passage in Sicily, along the Illyrian shore, and especially through the Peloponnessus and Crete. The second lecture treated of the State of Research in Greece, and the great harm done to Art history and investigation by repressive laws concerning archæological researches. A well organized American school—not exciting like those of other nations the susceptibilities of the Greeks—would be the most potent possible agency

to bring about a modification of the present law. In his third lecture, on the Relations of Art to Archæology, Mr. Stillman argued that true art was not imitation of nature, but the expression of an ideal of the human mind.

Dr. A. Emerson, Fellow in Greek, gave six lectures on Olympia, (March 26 to April 7.) He first gave an historical sketch of the Olympic festival, and described the various contests which took place on each of the five days during which the festival lasted. The people of Elis were the managers of the games, and this curatorship preserved to Elis its early independence. The character of the games declined greatly during the Roman period, until they were finally prohibited by Theodosius in 394. Although burned in 426, the temple of Zeus does not seem to have been fully destroyed until the great earthquake of 551. Of the architectural monuments of the Altis, the Heraion and the temple of Zeus were the most important. The former building, of uncertain but early date, establishes the wooden derivation of the Doric style. The temple of Zeus was founded in the 77th Olympiad by the Eleian architect, Libon. Paionios was the author of the sculptures of the Eastern pediment, and Alkamenes filled the Western pediment; the whole being under the direction of Paionios, who was awarded the prize in the competition. The sculptures of both pediments have been so far recovered by the German explorers that restorations in general unessential have been sufficient to complete them. Two *chefs d'œuvre* of free sculpture were also found in the excavations: the colossal marble Victory, by Paionios, and the Hermes holding the infant Dionysos, an early work of Praxiteles.

The concluding lecture (April 9) was by Professor Gildersleeve on the Relations of Literary and Plastic Art. The history of both these incorporations of national life shows many points of resemblance which were dwelt on in some detail. Our age has a better appreciation of both literature and art and these studies ought not to be dissociated.

In February, an Archæological Society was formed at the University for the voluntary prosecution of this study. Its meetings, which took place monthly, included the reading of papers on Ancient and Christian Art and reports on recent discoveries and investigations. At the first meeting (February 16), Dr. Frothingham discoursed on the study, past and present, of Christian Archæology, and its importance for obtaining a comprehensive view of history. Dr. Emerson reviewed the history of the study of Classical Archæology among civilized nations, especially during the last forty years. Maj. J. W. Powell, Director of the U. S. Bureau of Ethnology, gave an address on the Archæology of the Aboriginal Races of the United States, sketching the condition of handicraft among the different tribes. The meeting of March 14 was addressed by Mr. Clarke on the subject of the Entasis in Greek architecture, giving the results of original researches on the nature of the curved outlines of columns, employed by the Greeks to overcome an optical deception. Mr. Hoskins made a report on the collection of casts in the Peabody Institute. Mr. Stillman addressed the next

meeting (March 22) on the Acropolis of Athens, describing its site, the means of access, and the principal buildings (the Parthenon and the Erechtheum); the lecture was illustrated by numerous photographs. A report on the works regarding ancient art contained in the Peabody Library was made by Dr. Emerson. At the last meeting (May 9) Dr. Frothingham read a paper on the history of Mosaic-painting since the Christian era, emphasizing the important place it holds in art-history, as it furnishes an almost unbroken series of well-preserved works during a period of twelve centuries. Dr. Emerson showed the interest of a well-organized and classified collection of electrotype reproductions of ancient coins.

In connection with the Society, Dr. Frothingham organized several circles for the study of various phases of Art, illustrated by photographs and art-books. At weekly meetings the following subjects were examined:

Romanesque Architecture. (March 1).

Gothic Architecture. (March 8).

Italian Sculpture during the XIII-XIV centuries. (March 22).

Italian Painting during the XIV century. (March 29).

Italian Painting during the XV century. (April 5).

Ivory Carving from the IV to the XIV century. (May 3).

The object of these informal lectures was to give a general idea of the subject studied, supported by such numerous representations as should give familiarity with the most characteristic works of the period.

The Archæological Institute of America which was founded five years ago for the promotion of archæological research and discovery on classical and American soil, has been during this time centred in Boston, although New York also furnished a considerable number of members. Feeling the danger of an interest too much centralized to be long efficient, the Council of the Institute at its meeting in Boston (May 17, 1884), proposed a new constitution by which the Institute should consist of affiliated societies in various cities. Wherever at least ten members organize they may form an affiliated society and send a member to the general council; a membership of fifty gives the right to a second delegate. Beside sharing in the general advantages of the Institute and influencing the work undertaken by it, these societies may create local interest by meetings, publications, etc. In order to further the formation of such a society in Baltimore, the University Archæological Society appointed Drs. Emerson and Frothingham as a committee. In a short time an organization of twenty-four members was formed and the "Baltimore branch of the Archæological Institute of America" was organized on June 5, with Mr. J. W. McCoy as president, and Drs. Emerson and Frothingham as recording and corresponding secretaries.

This newly formed society is quite distinct, both in its organization and in its aims, from that of the Johns Hopkins Archæological Society. The object of the University society is to excite among students in the various departments, an interest in the subject of art history and the first manifesta-

tions of early civilizations. It aims to attract the student of psychology by aesthetics, the student of history and philology by the valuable aid and suggestions it affords to both these departments.

The Baltimore branch of the American Institute, on the other hand, if it continue the custom which has hitherto been followed, will have but two meetings in the year. It consists both of those who take an active part in archæological work and of the patrons of art who are interested in furthering the efforts of American workers in a field so well cultivated by other nations. There can be no doubt that Baltimore will take, as is its due, an important share in giving this encouragement.

The valuable Cohen collection of Egyptian Antiquities, which has recently been acquired by the University, will be of great interest, not only for art, but for the historical study of the customs and laws of Egypt. It was begun in 1832 by Col. M. I. Cohen during his travels in Egypt, and consists of six hundred and eighty nine objects procured mainly in the localities where they were originally discovered. A number of objects, however, belonged to the famous collection of Mr. Salt, H. M. consul in Egypt, which was sold in 1835. The collection consists chiefly of small works illustrating the history of the minor arts in Egypt from the XVIII dynasty to that of the Ptolemies.

The University has also purchased plaster casts, on a reduced scale of 1:10, of the two pediments of the temple of Zeus at Olympia. They had recently been executed at Berlin, under the direction of Curtius and Hirschfeld, by the sculptor Grüttner.

The University, in connection with other American institutions, has continued for several years its subscription for the maintenance of the school of Classical Archæology at Athens.

A word may be now said on future work. One great difficulty in giving an educational impulse to studies in art history, especially for beginners, is the lack of reproductions from the originals. A systematic collection of photographs would be a most efficient and practical means of education, producing that familiarity with the monuments which is the first requisite towards gaining an insight into the study. This system was tried with success at the art circles described above. For the sum of three hundred and fifty dollars, a fine collection of about one thousand good sized photographs could be procured, which should illustrate all art periods, *e. g.*: Assyria, 60 (\$35); Egypt, 60 (\$35); Greece, 125 (\$65); Rome, 100 (\$25); Early Christian (Arch. Sculp. Paint.), 100 (\$30); Romanesque and Gothic (Arch. Sculp. Paint.), 200 (\$50); Renaissance, 150 (\$35); Italian Painting, 200 (\$60). Such a collection would be in continual use for the illustration of lectures or the inspection of art circles.

Most necessary also for classical archæology—as Dr. Emerson has shown—is a select collection of electrotpe reproductions of ancient coins. It would illustrate admirably the history and literature of Greece and her colonies, and often also the condition of art in various provinces at the same

period. The British Museum has, under the direction of Mr. Barclay V. Head, made such a collection of electrotypes divided into chronological and geographical sections. Specimens of the most important of these sections, consisting of a hundred and fifty coins, could be procured for the sum of \$125; these would represent chronologically the history of the numismatic art from its beginnings in Greece (c. 700) to the age of Alexander, and geographically, the East, Greece proper, and the West.

A. L. FROTHINGHAM, JR.,

*Corresponding Secretary of the
Johns Hopkins Archaeological Society.*

BALTIMORE, November, 1884.

F.

Gifts to the Library from September 1, 1883, to September 1, 1884.

- ACLAND, H. W. (Author). *Ground-work of Culture*. London, 1883. O.
 ALLAN, COL. WM. *Ceremonies connected with the Inauguration of the Mausoleum of Gen. Robert E. Lee*. Lynchburg, 1883. O.
 ALLINSON, E. P. (Author). *The Study of American Constitutional History*. Philadelphia, 1884. O.
 ANDRUS, W. R. *Report on Railroads of California, 1880-83*. 2 vols. O.
 ARMSTRONG, W. A. *U. S. Commissioner's Report on Railroads, 1881-82*. O.
 BROTHER AZARIAS. (Author). *Culture of the Spiritual Sense*. N. Y., 1884. O.
 BAKER, J. H. *Railroad Reports for State of Minnesota, 1883*. O.
 BARTLETT, M. T. *South Carolina Railroad Commissioner's Report, 1883*. O.
 BECKER, G. F. (Author). *Geology of the Comstock Lode*. Washington, 1882. Q.
 BILLINGS, J. S., M. D. *Index Catalogue, Library of Surgeon-General's Office*. Vol. 4. Washington, 1883. Q.
 BIRNEY, W. Waite, C. B. *History of the Christian Religion to the year 200*. Chicago, 1881. O.
 Sketch of the Life of James G. Birney. Chicago, 1884. D.
 BISHOP, J. *Statistics of Labor and Industries, Statistical Bureau, New Jersey, 1878-82*. 7 vols. O.
 BOUTWELL, F. M. (Author). *Old Highways and Landmarks of Groton, Mass.* Groton, 1884. O.
 BROWN, HON. G. W. *A collection of miscellaneous pamphlets*.
 BROWN, J. L. *Report of Auditor of State of Iowa, 1882-83*. O.
 BROWN, W. H. *Pennsylvania R. R. Co. Reports, 1-37*. O.
 BUTLER, A. P. *South Carolina Resources, etc.* Charleston, 1883. O.
 South Carolina Agricultural Reports. 4 vols. O.
 BUZBY, G. L. *Philadelphia Board of Trade Report, 1883*. O.
 CHAMBERLIN, T. C. (Author). *Report on the Geology of Wisconsin*. 2 vols. O.
 CHISHOLM, J. J., M. D. (Author). *Manual of Military Surgery*. Columbia, S. C. 1864.
 Lieber, O. M. *Survey of South Carolina*. Charleston, 1856. Q.
 Tuomey, M. *Geology of South Carolina*. Charleston, 1848. Q.
 CONGREGATIONAL PUBLICATION SOCIETY. *Congregational Year Book, 1879-1884*. 6 vols. Boston, 1879-84. O.
 Minutes of the National Council of the Congregational Churches of the U. S. Boston, 1880-83. O.

- CRAFTS, W. A. Report of the Railroad Commissioner of Massachusetts, 1871-78, 1880. 1882-84. 8 vols. O.
- DALR, T. N. (Author). Outskirts of Physical Science. Boston, 1884. D.
- DIPPOLD, G. T. (Author). Great Epics of Mediæval Germany. Boston, 1882. D.
- DIXWELL, GEO. B. (Author). Premises of Free Trade Examined. Cambridge, 1883. O.
- DOBBIN, HON. G. W. Backus, I. History of New England. Boston, 1777. D.
- A collection of miscellaneous pamphlets.
- DODGE, J. H. Report of City Auditor of Boston, 1882-83. O.
- DONALDSON, H. H. Nature. London, Vols. 9-29. 28 vols. bound. Q.
- DRAPER, L. C. (Author). King's Mountain and its heroes. Cincinnati, 1881. O.
- ELY, R. T. Hughes and Neale. Manual for Coöperation. London, 1881.
- EWEN BROS. Map showing Cotton Trade and Stocks, 44 x 34. N. Y., 1884.
- FARLEY, J. H. Reports of City of Cleveland, 1882. O.
- FRAZER, P. (Author). Géologie de la Pennsylvanie. 1882. O.
- FREEMAN, E. A. (Author). The Place of Carlisle in English History. O.
- The Early History of Sussex.
- How the Study of History is Let and Hindered.
- English Towns and Districts.
- MacCarthy, Rev. E. F. M. The Growth of the English and American Educational Ideals. Birmingham, 1884. O.
- FRENCH, HON. T. Report of U. S. Auditor of Railroad Accounts, 1878-80. 2 vols. O.
- FROTHINGHAM, A. L. Alunno, F. Le Ricchezze della Lingua Volgare Venice (Aldus) 1551. F.
- Phillips, E. New World of Words. London, 1706. F.
- FROTHINGHAM, A. L., JR. (Author). L'Omella di Giacomo di Sardi sul Battesimo di Costantino Imperatore. Rome, 1883.
- Il Tesoro della Basilica di S. Pietro in Vaticano dal XIII al XV Secolo. Rome, 1883.
- Une Mosaïque Constantinienne Inconnue à Saint-Pierre de Rome. Paris, 1883.
- GIBSON, HON. J. City of Kansas Revised Ordinances, 1880. O.
- GLEN, F. W. [through Mr. E. R. L. Gould]. Geological and Natural History Survey of Canada. Montreal, 1883. O.
- Reports of Government of the Dominion of Canada. 16 vols. O.
- GNICK, GOV. G. W. Kansas Public Documents, 1877-82. 3 vols. O.
- GOODELL, HON. A. C., JR. (Author). An Account of the Seals of the Colonial and Provincial Courts of Massachusetts, 1680-1780. Cambridge, 1883. O.
- Further Notes on the History of Witchcraft in Massachusetts. Cambridge, 1884. O.
- Trial and Execution of Mark and Phillis, Slaves of Capt. John Codman, for Petit Treason, in 1750. Cambridge, 1883. O.
- GRAY, J. T. Report of Baltimore Police Commissioners, 1882-83. O.
- GREEN, HON. S. A. Tucker, W. The Valley of Andorra. Cambridge, 1882. D.
- Tucker, W. Republic of San Marino. D.
- Tucker, W. Territory of Moresnet. Cambridge, 1882. D.
- Boston Board of Health, Eleventh Report. O.
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Also, from various official sources, U. S. Reports and other Government Publications; Publications of the Smithsonian Institution; Official documents of various States and Cities.

PROFESSOR JAMES BRAYCE, M. P., has presented to the library of the University a valuable collection of parliamentary documents of the last session, including Reports of the Irish Land Commission, the Government correspondence concerning affairs in South Africa, and the texts of Bills introduced into the House of Commons, 1883-4, etc.

G.

List of Foreign Exchanges.

The following list gives the names of the foreign societies and journals with which regular exchanges of publications have been made by the university during the year.

GERMANY AND AUSTRIA.

- Berlin.** Königl. akademie der wissenschaften.
 Deutsche chemische gesellschaft.
 Jahrbuch über die fortschritte der mathematik.
 Journal für reine und angewandte mathematik. (Crelle.)
 Der naturforscher.
 Vierteljahrsschrift für volkswirtschaft, etc.
 Zeitschrift für deutsches alterthum.
 Zeitschrift für völkerpsychologie und sprachwissenschaft.
- Braunschweig.** Akademische blätter.
 Archiv für das studium der neueren sprachen.
- Cassel.** Verein für naturkunde.
- Cöthen.** Chemiker zeitung.
- Giessen.** Jahresbericht über die chemie und physik.
 Zeitschrift f. alttestamentl. wissenschaft.
- Gotha.** Zeitschrift für kirchengeschichte.
- Göttingen.** Königl. gesellschaft der wissenschaften.
 Beiträge zur kunde der indogermanischen sprachen.
- Halle.** Beiträge zur geschichte der deutschen sprache.
- Heidelberg.** Naturhistorisch-medizinische verein.
- Heilbronn.** Englische studien.
 Literaturblatt f. german. und roman. philologie.
- Jena.** Jenaische zeitschrift für naturwissenschaften.
- Kiel.** University of.
 Astronomische nachrichten.
- Leipzig.** K. Sächsische gesellschaft der wissenschaften.
 Archiv der mathematik und physik. (Grunert.)
 Archiv für lateinische lexikographie.
 Jahrbücher für classische philologie.
 Liebig's annalen der chemie. (Wöhler, Kopp.)
 Literaturblatt für orientalische philologie.
 Mathematische annalen. (Clebsch.)
 Unsere zeit.
 Wochenschrift für klassische philologie.
 Zeitschrift für mathematik und physik. (Schlömilch.)
 Zeitschrift für krystallographie und mineralogie.
 Zeitschrift für allgemeine sprachwissenschaft.
 Zeitschrift für neu-französische sprache.
 Zeitschrift für keilschriftforschung.
 Zoologischer anzeiger.
- Mainz.** Concordia.
- Marburg.** Jahresbericht u. d. fortschr. d. chemie.
- Munich.** Königl. akademie der wissenschaften.
- Strassburg.** Zeitschrift für physiologische chemie.

Stuttgart. Finanz archiv.
 Trieste. *Klavis*.
 Tübingen. Jahresbericht für reine chemie.
 Vienna. K.-k. akademie der wissenschaften.
 Ornithologische verein.
 K.-k. geologische reichsanstalt.
 Weisbaden. Zeitschrift für analytische chemie. (Fresenius.)
 Würzburg. Medicinische facultät.

*
 FRANCE AND SWITZERLAND.

Cherbourg. Société nationale des sciences naturelles et mathématiques.
 Paris. Institut de France: Académie des sciences.
 Association pour l'encouragement des études grecques.
 Bureau des longitudes.
 École normale supérieure.
 École polytechnique.
 Observatoire de Paris.
 Société chimique de Paris.
 Société historique.
 Société mathématique de France.
 Société de législation comparée.
 Société de l'histoire du protestantisme français.
 Annales de chimie et de physique.
 L'astronomie.
 Bulletin des sciences mathématiques et astronomiques.
 Bulletin des antiquités africaines.
 Journal Asiatique.
 Journal de mathématiques pures et appliquées.
 Moniteur scientifique.
 Nouvelles annales de mathématique.
 Reforme sociale.
 Revue de chefs-d'œuvre.
 Revue internationale de l'enseignement.
 Revue linguistique.
 Revue politique et littéraire.
 Revue scientifique.
 Roscoff. Laboratoire de zoologie expérimentelle.

Bern. Schweiz. gesellsch. für die gesammten naturwissenschaften.
 Zurich. Société helvétique des sciences naturelles.

BELGIUM AND HOLLAND.

Amsterdam. K. akademie van wetenschappen.
 Brussels. Académie des sciences de belgique.
 Musée royal d'histoire naturelle.
 Annales du bibliophile.
 Ghent. Mathésis.
 Archives de biologie.
 Harlem. Musée Teyler.
 Leyden. Nederlandse dierkundige vereniging.
 Récueil des travaux chimiques des Pays-Bas.
 Liège. Société royale des sciences.
 Louvain. Le muséeon.

ITALY; SPAIN; PORTUGAL.

- Catania. Società tecnica.
Florence. Rivista scientifica industriale.
Milan. Istituto Lombardo di scienze e lettere.
Annali di matematica pura ed applicata.
Archivio storico lombardo.
Naples. Giornale di mathematiche.
Zoologische station zu Neapel.
Palermo. Gazzetta chimica Italiana.
Rome. Reale accademia dei Lincei.
Comitato geologico d'Italia.
Buletino di archaeologia Cristiana.
Commissione archaeologica comunale.
Società romana di storia patria.
La cultura.
Turin. Reale accademia delle scienze.
Archives Italiennes de biologie.
Archivio di psichiatria, scienze penali, etc.
Rivista di chimica medica.
Rivista storica Italiana.
Observatoria.
Venice. Reale istituto Veneto.
-
- Coimbra. Jornal de ciencias mathematicas e astronomicas.
Lisbon. Academia real das sciencias.
Sociedad de geographia.
Madrid. Industria ibérica.

GREAT BRITAIN AND IRELAND.

- Birmingham. Philosophical society.
Cambridge. Philosophical society.
Philological society.
Dublin. Royal Irish academy.
Trinity college.
Edinburgh. Royal society.
London. Royal society.
Royal astronomical society.
Royal microscopical society.
Royal institution of Great Britain.
Chemical society.
Crystallogical society.
Mathematical society.
Mineralogical society.
Philological society.
Science and art department, South Kensington.
Society of biblical archaeology.
Society of telegraph engineers.
Society of chemical industry.
Analyst.
Antiquarian magazine.
Brain.
Chemical news.
Christian socialist.
Journal of conchology.
Journal of education.

London. Journal of hellenic studies.
Macmillan's magazine.
Palestine exploration fund.
The month.

Manchester. The Owens College.

DENMARK, SWEDEN AND NORWAY; RUSSIA AND FINLAND.

Bergen. Museum.

Copenhagen. Royal academy.
Tidskrift for matematik.

Nordisk tidskrift for philologie.

Christiania. Archiv for matematik og naturvidenskab.
University of Christiania, publications.

Norwegische commission der gradmessung.

Nyt magasin for naturvidenskaberne.

Stockholm. Royal Swedish academy of sciences.

Acta mathematica.

Hogakola.

Physiological laboratory of university.

Geologische foreningen i Stockholm.

St. Petersburg. Académie impériale des sciences.

Russian chemical society.

Moscow. Société impériale des naturalistes.

Helsingfors. Société des sciences de la Finlande.

BRITISH INDIA.

Calcutta. Asiatic society of Bengal.

Ambala. Panjab notes and queries.

Kandy. The orientalist.

SYRIA.

Beyrout. Muktataf.

JAPAN.

Tokio. University, publications of scientific department.

Seismological society of Japan.

AUSTRALIA AND NEW ZEALAND.

Sydney. Royal society of New South Wales.

Adelaide. Royal society of South Australia.

Wellington. Colonial museum.

New Zealand institute.

Geological survey.

MEXICO.

Mexico. Revista científica Mexicana.

Observatorio.

SOUTH AMERICA.

Rio de Janeiro. Observatoire impériale.

Cordoba. Academia nacional de ciencias.

Quito. Anales de la universidad.

CANADA.

Montreal. Royal society of Canada.

Canadian naturalist.

Ottawa. Geological survey of Canada.

H.

Description of new Buildings.

BIOLOGICAL LABORATORY.

The recently opened biological laboratory of the Johns Hopkins University is eighty-four by fifty-two feet in external measurement, and consists of three stories and a basement. It is built of Baltimore pressed brick; with steps, entry, window sills, and band-courses of Cheat-river bluestone. A fact that at once attracts attention is the number and large size of the windows; as the laboratory is free on all sides, it is therefore very well lighted.

On ascending the front steps, and passing through the door, the visitor enters the main hall, from which a wide staircase ascends to the third story, and on which most of the rooms of the first floor open. This floor is given up to the regular class-instruction of students not engaged in special work. It has on it a lecture-room with seats for sixty; a storeroom connected with this, for the keeping of diagrams and lecture-apparatus; an administration-room, the headquarters of the chief assistant; a preparation-room containing a supply of the reagents, specimens and material required for the daily practical class-work; and the large general laboratory, thirty-two by forty-eight feet.

The latter has windows on three sides. Around these sides runs a work-table, supported, independently of the floor, on brackets attached to the walls, and affording ample space for thirty students. If necessary, a second table can be set inside this, giving places for fifteen or twenty more. The centre of the room is in part occupied by a dissecting and a chemical table. The latter is supplied with the reagents and appliances for practical work in elementary chemical physiology. The dissecting table has a slate top, and is provided with a sink and water-tap between every two students. The inner side of the room has, against the wall, tables for scales and the warm-water oven; a large hood for the performance of chemical operations calculated to give rise to noxious vapors; and a dumb-waiter leading to the basement, on which articles can be sent up from the storerooms there when called for. Near the centre of the room is a chute, lined with plate-glass (so as to be readily kept clean), and passing direct to the furnace-room below. Through this chute all refuse is at once got rid of. The floor of this room, and of several others in the building, is of asphalt, and the walls of hard cement to a height of two and a half feet. Thus the floor can be flooded with water, and thoroughly cleansed whenever desirable.

The work to be done in this room annually is as follows; by the first-year students, a thorough macroscopic and microscopic examination of about

twenty-five selected vegetable and animal organisms illustrative of the course of lectures on general biology, and a study of the embryology of the chick; by second-year students, a course in practical animal physiology and histology a little more extended than that given in Foster and Langley's 'Practical Physiology.'

The second floor contains the following rooms: a laboratory for research and advanced study in animal morphology, and a corresponding room for botanical work (used at present as the laboratory of psycho-physiology); a photographing-chamber, with heliostat and other appliances for micro-photography; a library of biological text-books, monographs, and journals; a small lecture-room, capable of seating about thirty; an assistant's private room; a museum containing such typical osteological and other specimens as are needed by students pursuing the regular courses of class-instruction, and the beginning of a collection of the local fauna and flora, made by the members of the field-club; and a store and preparation room for the curator of the museum.

The third floor is mainly given up to advanced students in physiology and histology. It has three large work-rooms; a dark chamber for spectroscopic work, for experiments in physiological optics, etc.; the director's private room; a room for the myograph; an assistant's private room; the mechanics' shop, for the construction and repair of instruments; and a small balance-room.

The building being heated by steam supplied from a boiler in the neighboring chemical laboratory, the basement, which is well lighted, is left free for use. The scientific work-rooms in it are a large, well-equipped room for advanced study in chemical physiology, a balance-room, and a room for the study of animal electricity. The basement also contains a suite of three rooms, which form the janitor's headquarters where he has charge of the necessary stock of chemicals and glassware, and has also a carpenter's bench, at which he does any simple bit of carpentering required. From one of these rooms a shaft two feet square runs to the top of the building, communicating with each floor. Through this shaft it is intended to run wires to various work-rooms, transmitting electrical currents for the running of chronographs, and for similar purposes. The shaft was also planned in the hope that ultimately the clock-work of kymographs and such instruments will be replaced by electrical energy generated by an engine and dynamo in the basement, and distributed thence over the building. The remaining rooms in the basement are, the "animal room," fitted up with tanks for the keeping of frogs, terrapins, and so forth; and the furnace-room. The latter contains a cremation-furnace, in which all the combustible *débris* of the laboratory is disposed of, and a boiler and condenser for the preparation of distilled water; it has also in it a small steam-engine, designed to be used for running a centrifugal apparatus.

DIAGRAMS SHOWING THE ARRANGEMENT OF ROOMS.

FIRST FLOOR.

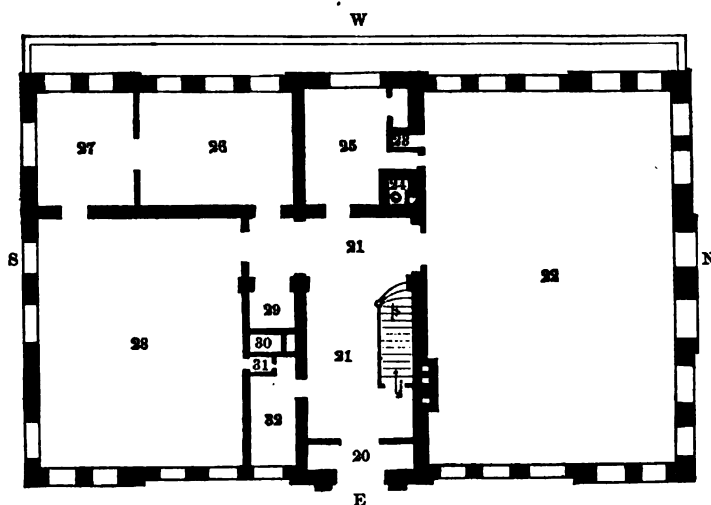


FIGURE 1.—20, vestibule; 21, main hall; 22, work-room for practical instruction of less advanced students; 24, 30, ventilating shafts; 23, storeroom of materials and reagents for general practical class-work; 25, chief assistant's room; 27, storeroom for diagrams and lecture-apparatus; 28, lecture-room; 29, elevator; 33, cloak-room.

SECOND FLOOR.

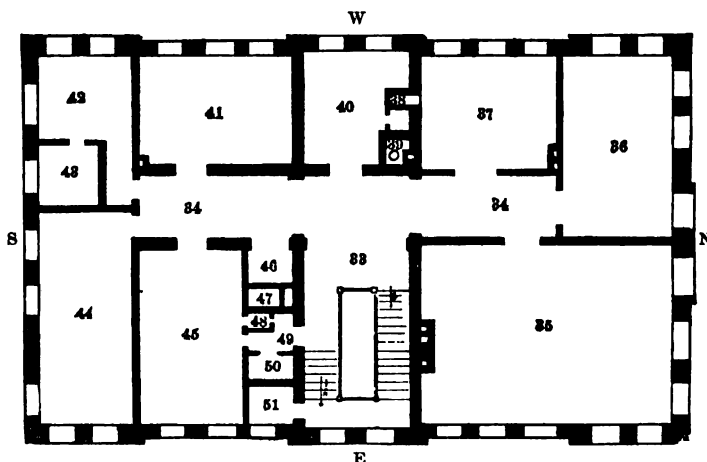


FIGURE 2.—33, 34, hall and corridor; 35, museum; 36, advanced morphology; 37, preparation-room for museum; 40, assistant's room; 41, library; 42, 43, photography; 44, advanced botany; 45, lecture-room; 46, elevator; 47, 48, ventilating shafts; 51, lavatory.

THIRD FLOOR.

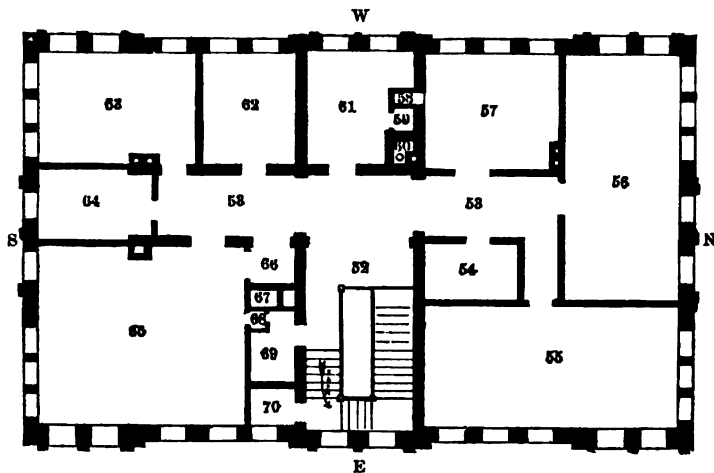


FIGURE 3.—52, 53, hall and corridor; 55, experimental physiology; 56, advanced histology; 57, workshop; 54, balance-room; 61, assistant's room; 62, myograph-room; 63, director's private room; 64, dark chamber; 65, experimental physiology; 66, elevator; 68, 67, ventilating shafts; 69, closet; 70 lavatory.

BASEMENT.

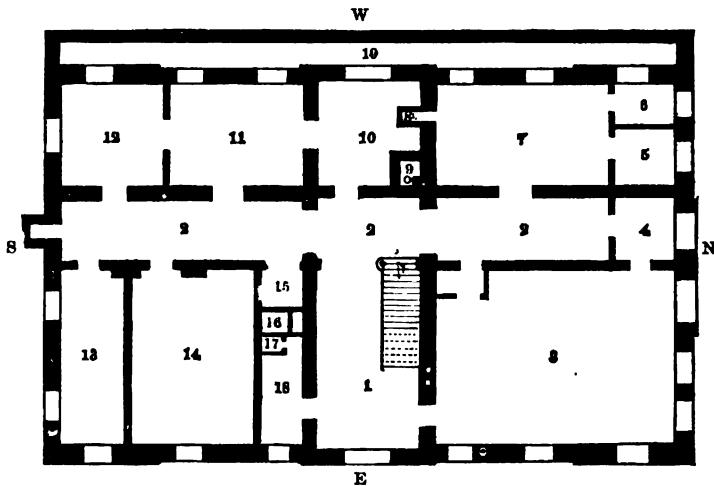


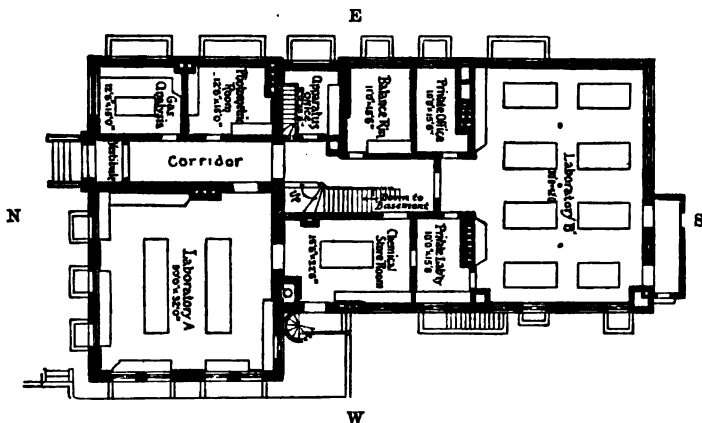
FIGURE 4.—1, 2, entrance and corridor; 3, chemical physiology; 4, balance-room; 7, furnace-room; 10, 11, 12, janitor's store and battery rooms; 13, animal-room; 14, electro-physiology; 15, elevator; 16, 9, ventilating shafts; 18, lavatory.

CHEMICAL LABORATORY.

The original laboratory for Chemistry was built in the expectation that it would be large enough for a period of five years. At the end of that time there was not room for all who wished to avail themselves of its privileges, and consequently the Trustees, in June, 1882, decided to enlarge it. Plans were accordingly drawn and contracts made, and on the third of May, 1883, the building in its improved and extended form was completed and thrown open to public observation. It now covers an area of about fifty by one hundred feet and has three full stories and a basement. In the basement are the necessary conveniences for assaying and other furnace operations; on the first floor there are large rooms devoted mainly to qualitative and quantitative analysis; on the second, are rooms for research, for the study of the director, the library, and for lectures in General Chemistry. On the third floor are rooms for the chemical and mineralogical collections, a working and lecture-room for mineralogy, and a second lecture-room for chemistry. The entire laboratory will conveniently accommodate about ninety working students.

DIAGRAMS SHOWING THE ARRANGEMENT OF ROOMS.

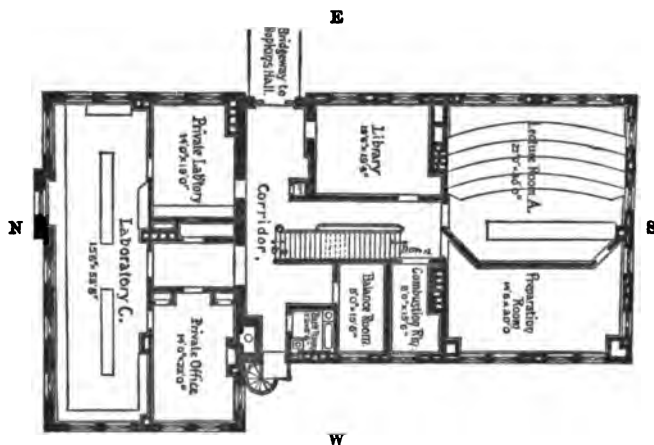
FIRST FLOOR.



The first floor is devoted mainly to such work as is commonly carried on in chemical laboratories. Laboratory A (measuring 30 by 32 feet), is intended especially for those who are beginning the study of chemistry; and Laboratory B (measuring 30 by 42 feet), for more advanced students, who are engaged in quantitative analysis and in making difficult preparations.

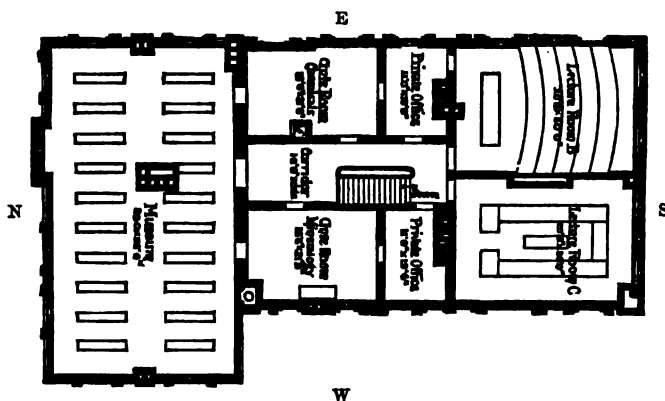
APPENDIX.

SECOND FLOOR.

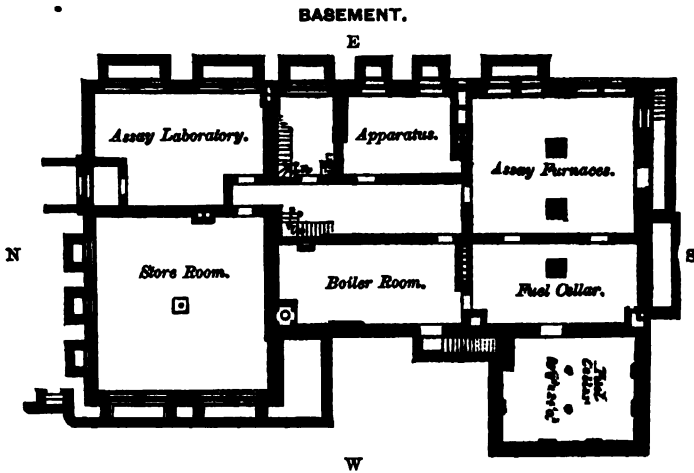


The advanced work is carried on in the second floor. Laboratory C (measuring 15.6 by 53.6 feet, and cased with enamelled bricks), is used as the research laboratory. The principal lecture room and the Chemical library as well as the Director's rooms, are also on this floor.

THIRD FLOOR.



The principal room on the third floor (30 by 53.6 feet, in extent) is intended for a cabinet of chemical substances, including examples of industrial processes and results. At present this room also contains a good working collection of minerals. There are also two smaller lecture rooms, one of which is conveniently arranged for instruction in mineralogy.



The basement contains store rooms for chemical apparatus, two well lighted rooms for assay work and other furnace operations; besides the boiler room and fuel vaults.

THE GYMNASIUM.

The Gymnasium has been planned to meet the requirements of two hundred and fifty persons, and especial pains have been taken to secure an abundance of light and air in the main hall, and the dressing rooms connected with it.

The ground plan of the building in which the gymnasium and dressing rooms are contained resembles in shape a letter **L**, turned thus **┐**. The main building of the **┐** abutting on Garden street is 104 feet in length, includes the gymnasium proper and a vestibule, and the wing of the **┐** extending from Garden street to the rear of Bentley Hall is nearly 85 feet in length. The entrance to the building is on Garden street at the junction of the main building and the wing of the **┐**. The entrance is through a vestibule, out of which, upon the first floor, doors open into the main hall and into the private dressing rooms, while on the second floor at the head of a flight of steps, is the door of the Director's rooms, in which the physical examinations are made and recorded. The vestibule and gymnasium hall are in the new building; while the dressing and bath rooms, and the offices of the Director are in the wing.

The main hall comprises a single room, open to the roof, and has a total height from floor to ridge pole of 43 feet. It has upwards of 3400 square feet of flooring; its walls, of painted brick, are 25 feet high and 18 inches thick; and each of its side walls contains seven high and wide windows whose sills are seven feet from the floor.

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ISSUED November 26, 1884.

PUBLICATIONS OF THE
JOHNS HOPKINS UNIVERSITY
BALTIMORE.

- I. **American Journal of Mathematics.**
S. NEWCOMB, Editor, and T. CRAIG, Associate Editor. Quarterly. 4to.
Volume VII in progress. \$5 per volume.
- II. **American Chemical Journal.**
I. REMSEN, Editor. Bi-monthly. 8vo. Volume VI in progress. \$3 per
volume.
- III. **American Journal of Philology.**
B. L. GILDERSLEEVE, Editor. Quarterly. 8vo. Volume V in progress.
\$3 per volume.
- IV. **Studies from the Biological Laboratory.**
Including the Chesapeake Zoölogical Laboratory. H. N. MARTIN, Editor,
and W. K. BROOKS, Associate Editor. 8vo. Volume III in progress.
\$5 per volume.
- V. **Studies in Historical and Political Science.**
H. B. ADAMS, Editor. Monthly. 8vo. Volume III in progress. \$3 per
volume.
- VI. **Johns Hopkins University Circulars.**
Containing reports of scientific and literary work in progress in Baltimore.
4to. Vol. I, \$5; Vol. II, \$3; Vol. III, \$2; Vol. IV in progress. \$1 per
year.
- VII. **Annual Report.**
Presented by the President to the Board of Trustees, reviewing the opera-
tions of the University during the past academic year.
- VIII. **Annual Register.**
Giving the list of officers and students, and stating the regulations, etc., of the
University. *Published at the close of the academic year.*

In addition to the serials above named, a few copies may be obtained of the
works mentioned below:

- STUDIES IN LOGIC. By members of the Johns Hopkins University. C. S. Peirce,
Editor. (Boston. Little, Brown & Co.) 1883. 123 pp. 12o. \$2.00.
- THE DEVELOPMENT AND PROPAGATION OF THE OYSTER IN MARYLAND. By
W. K. Brooks. 1884. 193 pp. 4to. 13 plates and 3 maps. \$5.00.
- ON THE MECHANICAL EQUIVALENT OF HEAT. By H. A. Rowland. 1880.
127 pp. 8vo. \$1.50.
- NEW TESTAMENT AUTOGRAPHS. By J. Rendel Harris. 1882. 54 pp. 8vo. 4
plates. 50 cents.
- SIR WILLIAM THOMSON'S LECTURES ON MOLECULAR DYNAMICS. Delivered at
the Johns Hopkins University in October, 1884. Reproduced from steno-
graphic notes by the papyrograph plate process. About 350 pp., 4to. \$5.00.

Communications in respect to exchanges and remittances may be
sent to the Johns Hopkins University (Publication Agency), Balti-
more, Maryland.

The **UNIVERSITY REGISTER** for the current academic year, 1884-85, and the **PROGRAMME** for the next year, 1885-86, will be issued in June, 1885.

TENTH ANNUAL REPORT

OF THE PRESIDENT OF THE

From JOHNS HOPKINS UNIVERSITY

Baltimore, Maryland

1885

ACADEMIC STAFF, 1885-86.

Daniel C. Gilman, LL. D.,	<i>President of the University.</i>
J. J. Sylvester, F. R. S., D. C. L.,	<i>Professor (Emeritus) of Mathematics.</i>
Basil L. Gildersleeve, Ph. D., LL. D.,	<i>Professor of Greek.</i>
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H. Newell Martin, Dr. Sc., A. M., M. D.,	<i>Professor of Biology.</i>
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Ira Remsen, M. D., Ph. D.,	<i>Professor of Chemistry.</i>
Henry A. Rowland, Ph. D.,	<i>Professor of Physics.</i>
William H. Welch, M. D.,	<i>Professor of Pathology.</i>
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Léonce Rabillon, Bach. ès Lett.,	<i>Lecturer on French Literature.</i>
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Maurice Bloomfield, Ph. D.,	<i>Associate Professor of Sanskrit.</i>
William K. Brooks, Ph. D.,	<i>Associate Professor of Morphology.</i>
Thomas Craig, Ph. D.,	<i>Associate Professor of Applied Mathematics.</i>
A. Marshall Elliott, A. M.,	<i>Associate Professor of the Romance Languages.</i>
Harmon N. Morse, Ph. D.,	<i>Associate Professor of Chemistry.</i>
William E. Story, Ph. D.,	<i>Associate Professor of Mathematics.</i>
Minton Warren, Ph. D.,	<i>Associate Professor of Latin.</i>
George H. Williams, Ph. D.,	<i>Associate Professor of Mineralogy.</i>
Henry Wood, Ph. D.,	<i>Associate Professor of German.</i>
William Hand Browne, M. D.,	<i>Librarian and Associate in English.</i>
William T. Councilman, M. D.,	<i>Associate in Pathology.</i>
Richard T. Ely, Ph. D.,	<i>Associate in Political Economy.</i>
Fabian Franklin, Ph. D.,	<i>Associate in Mathematics.</i>
Edward M. Hartwell, M. D., Ph. D.,	<i>Associate in Physical Training.</i>
William H. Howell, Ph. D.,	<i>Associate in Biology.</i>
J. Franklin Jameson, Ph. D.,	<i>Associate in History.</i>
Arthur L. Kimball, Ph. D.,	<i>Associate in Physics.</i>
Henry A. Todd, Ph. D.,	<i>Associate in Romance Languages.</i>
Philip R. Uhler,	<i>Associate in Natural History.</i>
James W. Bright, Ph. D.,	<i>Instructor in English.</i>
Henry H. Donaldson, Ph. D.,	<i>Instructor in Psychology.</i>
Julius Goebel, Ph. D.,	<i>Instructor in German.</i>
George Hempl, A. B.,	<i>Instructor in German.</i>
J. P. McMurrich, Ph. D.,	<i>Instructor in Osteology, etc.</i>
Edward H. Spieker, Ph. D.,	<i>Instructor in Latin and Greek.</i>
Charles A. Perkins, Ph. D.,	<i>Assistant in Physics.</i>
Edmund Renouf, Ph. D.,	<i>Assistant in Chemistry.</i>
Hugh Newell,	<i>Instructor in Drawing.</i>
Charles L. Woodworth, Jr.,	<i>Instructor in Elocution.</i>

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TENTH ANNUAL REPORT

OF THE PRESIDENT OF THE

Johns Hopkins University

Baltimore, Maryland

1885



BALTIMORE

PUBLICATION AGENCY OF THE JOHNS HOPKINS UNIVERSITY

1885

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1884-85.

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	GEORGE W. DOBBIN, <i>ex officio</i> .

TENTH ANNUAL REPORT.

To the Trustees of the Johns Hopkins University :

I have the honor of submitting the tenth annual report of the progress of the Johns Hopkins University, which covers the ninth year of instruction and closes September 1, 1885. So much detailed information is now given in the Circulars which are published several times during the academic year, that the annual reports will doubtless be more and more regarded as convenient summaries of what has already been made known, and not as the original announcement of official actions.

The year has been one of quiet and satisfactory work without any fundamental changes in our methods or in our buildings. A full account is given, in the appendix, of all courses and classes.

THE GROUP SYSTEM OF UNDERGRADUATE STUDIES.

The Annual Register, published in June last, was thoroughly revised so as to make its state-

ments, which are of necessity complex, more easily intelligible, and especially to bring out more distinctly than hitherto the arrangement of undergraduate studies in parallel "Groups," each of which leads to the Bachelor's degree. Much thought has been given during the year to an application of the "Group" idea to those advanced courses which lead to the degree of Doctor of Philosophy; and a trial scheme has been prepared by the Board of University Studies, suggesting as judicious certain combinations of subjects in which instruction is here provided.

In a good system of collegiate education, there are always two forces at work, freedom and authority, both of which are important for the attainment of the highest results in mental development. Without spontaneous exertions on the part of the scholar in the pursuit of knowledge higher instruction is difficult, mechanical, and comparatively unfruitful; on the other hand the progress of a scholar, who is not guided by a qualified teacher, is in danger of being slow, blundering, and rambling. The problem which always perplexes college faculties, and also individual parents, teachers, and pupils, is the adjustment of these two forces so that the resultant motion shall be in the right direction, with the least possible loss of energy. The problem has grown more and more difficult during the last quarter of a century. Science has

made its great advances; modern languages have asserted their importance; the domain of classical instruction has been widened; history and political science have been recognized as of great educational value. Moreover, the pecuniary resources of American colleges have been enlarged, and the number of teachers, each desirous of enforcing the value of his own pursuits, has been greatly increased. It is not surprising therefore that the old "curriculum," as it is termed, has been essentially modified in most of the larger colleges of this country, and that "electives" are more and more allowed. These new and perplexing conditions have been recognized in this university since its foundation, and the experience of several years has confirmed the plans originally adopted. In place of a single curriculum, and instead of no curriculum, several parallel curricula have been arranged, which are assumed to be equally honorable, liberal and difficult, and which therefore lead to the same degree of Bachelor of Arts. They all include the study of (*a*) language and literature, (*b*) mathematics and other exact sciences, (*c*) historical and moral science, but the proportions of the different studies vary. Seven schedules are announced upon the Register, one of which must be chosen by every undergraduate who wishes to proceed to the Bachelor's degree. Certain studies are common to all these courses, that

is to say, must be taken up by every undergraduate. Besides giving evidence of a good English education, the student before his matriculation, must pass an examination in Latin and Mathematics, and also in Greek, unless he distinctly gives up the classical course, in which case he may offer German and French as a substitute. Whatever course he afterwards follows must include physical geography, history and the critical study of English; logic, ethics and psychology; the continued study of modern languages; at least a year in some scientific course connected with laboratory work; together with physical and vocal culture, and drawing. In addition to these studies he must devote his attention daily for two years to two comprehensive courses (such as Greek and Latin, or chemistry and physics, or Latin and mathematics, or modern languages, etc.), which will develop the tendency of his intellectual life. The seven groups, for which, in accordance with these principles, arrangements are now made, are these:—

1. Classical,—corresponding closely with what has been hitherto known in this country as the usual college course;

2. Mathematical-Physical,—which meets the wants of those who are expecting to enter upon the modern vocations in which rigid mathematical discipline is indispensable;

3. Chemical-Biological,—which is adapted to those, among others, who expect to enter upon the subsequent study of medicine;

4. Physical-Chemical,—which is most likely to be followed by students preparing for those scientific pursuits which are neither chiefly mathematical nor chiefly biological;

5. Latin-Mathematical,—which affords a good fundamental training, without prolonged attention to the study of Greek;

6. Historical-Political,—which furnishes a basis for the subsequent study of law;

7. Modern Language,—where French, German, English, and in exceptional cases, other modern languages, take the place of Latin and Greek in the traditional classical course.

NEW BUILDINGS.

Near the close of last year's session, plans were drawn for the construction of a Physical Laboratory on the site at the corner of Monument and Garden streets. The building will go rapidly forward and the contract provides for its completion September 1, 1886. This action of the Trustees will furnish much-needed relief to an important part of the university. The literary departments next require improved and enlarged rooms, for the accommodations now provided for them are inadequate and inconvenient. It should be borne in mind that the

number of students and of classes has rapidly increased, so that rooms which served us well enough at first are quite too restricted for our present necessities. The aggregate attendance has nearly doubled in the last five years. In History there are one hundred and nine scholars, in German one hundred and seven, in Latin sixty-four, and although these companies never meet as one class, yet they require a large amount of space. The library and the various subordinate collections of books for seminary use likewise occupy a great deal of room; so that the time is clearly at hand for the construction of an academical building adapted to literary in distinction from scientific work. We also want much better rooms for public assemblies. I cannot but hope that some friend of this university, some man of wealth who loves the place of his nativity or residence, and who desires to contribute toward the education of youth under most favorable circumstances, will offer to provide such a hall as we so much need. In Cornell University are separate halls which bear the names of McGraw, Sibley, and Sage; at Cambridge, New Haven, and Princeton, liberal gifts for buildings have frequently been made within the last few years; and I believe the day will surely come when a like spirit of liberality will be rendered to this foundation. It cannot come too soon.

NUMERICAL STATEMENTS.

The academic staff included during the year fifty-two teachers, five of whom were non-resident lecturers. The number of students enrolled during the year was two hundred and ninety, of whom one hundred and thirty were residents of Maryland, and one hundred and forty-five came here from thirty-two other States of the Union, and fifteen from foreign countries. Among the students were one hundred and seventy-four already graduated, coming from ninety-five colleges and universities; there were sixty-nine matriculates (or candidates for the degree of Bachelor of Arts); and there were forty-seven admitted as special students, to pursue courses of study for which they seemed fitted, without reference to possible graduation. The attendance upon the public lectures (not including those in French) averaged two hundred and twelve.

Nine young men have been admitted to the degree of Bachelor of Arts, and thirteen have been promoted to that of Doctor of Philosophy—making in all twenty-two graduates. Since degrees were first conferred, in 1878, eighty-eight persons have attained the Baccalaureate degree, and sixty-seven have been promoted to the degree of Doctor of Philosophy.

The following table indicates the enrolment of students in each year since the university was opened in the autumn of 1876:—

	Graduates, (incl. Fellows.)	Matriculates.	Non- Matriculates.	Total Enrolled.	Average Attend- ance at Public Lectures.
1876-77	54	12	23	89	60
1877-78	58	24	22	104	84
1878-79	63	25	35	123	96
1879-80	79	32	48	159	113
1880-81	102	37	37	176	186
1881-82	99	45	31	175	137
1882-83	125	49	30	204	148
1883-84	159	53	37	249	122
1884-85	174	69	47	290	212

The attendance upon some of the principal courses during the last five years has been as follows:

	1880-81.	1881-82.	1882-83.	1883-84.	1884-85.
Mathematics,	31	33	35	37	75
Physics,	35	42	50	56	80
Chemistry,	40	44	49	51	76
Mineralogy,					41
Biology,	25	32	30	47	44
Greek,	31	33	44	41	41
Latin,	40	39	41	48	64
Sanskrit, etc.,	*	6	8	10	25
Shemitic Languages, . .	*	*	*	13	13
German,	55	47	50	63	107
French, Italian, etc., . .	33	26	31	31	63
English,	29	22	45	50	68
History and Political Sci- ence,	40	40	64	88	109
Psychology, Ethics, etc., .	14	22	47	28	44

*Not recorded.

During nine years, eight hundred individuals have been enrolled as students, of whom three

hundred and eighty-six have come from Maryland, (including three hundred and eight from Baltimore), and four hundred and fourteen from forty-seven other States and countries. Of this number four hundred and seventy-four persons pursued courses as graduate students, and three hundred and twenty-six as collegiate students.

SIR WILLIAM THOMSON'S LECTURES.

Reference was made a year ago to the lectures which were given here in October, 1884, by Sir William Thomson, D. C. L., F. R. S., etc., Professor in the University of Glasgow. This was one of the most remarkable courses ever given in this university, whether the eminence of the lecturer be considered and the freshness and scope of his thoughts, or the intellectual character of the auditors who followed him. Most of his hearers were professors and teachers of physics, and many of them came from a long distance at a very considerable sacrifice. The subject was announced under the general term "Molecular Dynamics," and the treatment was confined to the Wave Theory of Light, largely dealing with the difficulties of the theory. A nearly *verbatim* report of what was said was published by the university, with the author's consent, soon after the lectures closed. These notes which were taken by Mr. A. S. Hathaway, lately a Fellow in Mathematics here, and now an instructor

in Cornell University, were printed by the papyrograph process. An edition of three hundred copies was sold at once. From a recent letter of Sir William Thomson, it appears that he is now expecting to recast these lectures and to issue them in a printed volume at an early day. An interesting account of the topics considered and of the methods employed in their discussion was published in *Nature* (London, Nos. 803, 805, 809, March, April, 1885) by Professor George Forbes, F. R. S., of London, who had been in Baltimore during the continuance of the course. This review has been reprinted in our current Circulars (Volume IV, page 113). As an indication of the impression made by the distinguished lecturer, Professor Forbes remarks: "The lectures treated of three branches of the subject: (1) the propagation of a disturbance through an elastic medium; (2) the character of molecular vibration; and (3) the influence of molecules on the propagation of waves. Each lecture generally dealt with two of these branches, and between the two parts of the lecture Sir William went among his audience and had some conversation with them. It was ever his object to discard the professorial attitude and give his lectures the aspect of conferences. Discussion did not end in the lecture-room, and the three weeks at Baltimore were like one long conference guided by the master-mind. It is not surprising

that at the end of that time there was a genuine feeling of sadness at parting on the part of teacher and taught alike."

The visit of Sir William Thomson recalled to many minds the previous and much longer residence among us of Professor Cayley of the University of Cambridge. After returning to England, he revised the lectures he had delivered here, making some important additions to them, and began to print the whole as a memoir in the *American Journal of Mathematics*. Seven chapters of this treatise on "the Abelian and Theta Functions" have already been published, and the editors anticipate the pleasure of seeing the memoir completed in subsequent numbers of the *Journal*.

LECTURES ON SHAKESPEARE AND OTHER PUBLIC LECTURES.

Special study was directed during the year to the writings of Shakespeare. Professor Corson, whose instructions during two preceding winters had exerted a marked influence in this community, gave twenty lectures upon Shakespeare, in January, February, and March. After two introductory discourses, he discussed ten of the principal plays, namely, *Romeo and Juliet*, *King John*, *Much Ado about Nothing*, *Hamlet*, *Macbeth*, *Coriolanus*, *Julius Cæsar*, *Antony and Cleopatra*, *Winter's Tale*, and *Cymbeline*. It was the speaker's purpose, as he stated it, to represent the poet's early, middle, and

late work, and, along with a presentation of the organic structure of the plays selected, to indicate Shakespeare's progress in the creation of character, to contrast his portrayal of characters with that of Ben Jonson and other contemporary dramatists, and especially to set forth his interpretation of life which is concretely resident in the plays,—in a word, to present the plays on the human side rather than on the scholastic.

In connection with this course, a Shakespeare Circle was formed among the students, and to those who were thus enrolled two dramatic recitals were given by David C. Bell, Esq., formerly of Canada and now of Washington. Two lectures were also given by Justin Winsor, Esq., of Harvard College, one on Shakespeare Bibliography and one on Shakespeare Portraiture, both illustrated by works which had been borrowed from the libraries in Baltimore and elsewhere, through the friendly mediation of Mr. J. W. M. Lee. It was intended to enlarge this list of lecturers on Shakespeare, but the inability of one Shakespeare scholar of great renown to accept the invitation which was extended to him, and the illness and death of another distinguished commentator interrupted the plan. At one of the Peabody concerts, under the direction of Mr. A. Hamerik, some pieces of music suggested by the return of Shakespeare's birthday were performed, but it was not found possible, with the

resources at our command, to secure a Shakespeare concert. Récitals of four plays were given at the Peabody Institute by Mr. Locke Richardson.

During the month of January, Mr. Edmund Gosse, of London, Clark Lecturer on English Literature in the University of Cambridge, gave a course of six lectures on the Rise of Classical Poetry in England from Shakespeare to Pope. These lectures have since been printed in a volume. Mr. Gosse by special request gave two other lectures of a less formal character on the poet Gray, of whose life and writings he had made a special study preparatory to the publication of a new edition of the poet's writings.

So large a number of persons desired to hear Professor Corson and Mr. Gosse that the authorities of the Peabody Institute kindly opened one of their large halls to the university and these lectures were therefore announced as under the auspices of both foundations.

Professor J. Rendel Harris gave a course of lectures on the Perpetuation of Ancient Manuscripts, addressed especially to the students of ancient languages, and subsidiary to philological, biblical, archæological, and historical research. As far as possible, they were illustrated by facsimiles and representations of the ancient documents to which reference was made. This course and the following were given in Hopkins Hall.

The modern science of Phonetics was presented in four lectures by Mr. A. Melville Bell, of Washington, the author of a work on "Visible Speech," which were followed by two lectures, from the same gentleman, on English Pronunciation.

A course of lectures on Spanish and Portuguese Literature was given by the principal teachers in the department of the Romance Languages. Mr. A. M. Elliott, the Associate Professor, took for his theme the life and writings of Camoens, and Mr. H. A. Todd, the Associate, discussed Contemporary Spanish Literature.

Mr. Rabillon gave forty lectures (in French) on select topics pertaining to French literature.

To the graduate students, a course of educational lectures was given on successive Saturdays, during the months of November, December and January. The speakers and their subjects were as follows:

- D. C. Gilman, Academic degrees;
- G. S. Hall, Student life;
- S. Newcomb, Mathematics and education;
- M. Bloomfield, Method of comparative philology as pursued to-day;
- W. K. Brooks, The zoölogical significance of education;
- T. Craig, Mathematical teaching in France;
- A. M. Elliott, Methods in the study of modern languages;
- R. T. Ely, Educational value of political economy;
- J. R. Harris, On the study of ancient MSS.;
- E. M. Hartwell, Physical training in American colleges;
- W. E. Story, Methods of teaching arithmetic;
- M. Warren, Application of the historical method to the study of Latin.

THE LIBRARY.

The Library has made a constant growth during the year. Large purchases have been made of books pertaining to Psychology and Pedagogics, History and Political Science, and the Shemitic Languages. A set of the *Annales de Chimie et de Physique* (1790–1875) has also been bought.

From the Librarian's report it appears that the accessions of the year have been 4,600 volumes, making the whole number of bound volumes now belonging to the collection, 26,315. Of these accessions, those relating to certain special studies have been placed in the rooms where those studies are pursued, as in previous years. While there are objections to this segregation, the want of room in the main library compels it.

The present distribution is substantially as follows:

1. On the main floor of the central library, dictionaries, cyclopædias, and standard books in literature, history and philosophy;

2. In alcoves adjacent to the central room sets of literary periodicals and scientific transactions; works on philosophy and pedagogics; Romance, Teutonic, and English philology and literature; bibliography;

3. On the floor above the central library, works on ancient and modern history, public law and

political economy, including the Bluntschli collection ;

4. In the classical rooms, the principal Greek and Latin writings ;

5. In the oriental class rooms, books pertaining to Shemitic languages, and to Sanskrit ;

6. In the chemical laboratory, the long sets of chemical journals, and works on chemistry ;

7. In the biological laboratory, books of biology, physiology, medicine, and hygiene.

To a considerable extent, current periodicals are placed near the books to which they belong ; but in the central room a very large number of those which are of general interest are retained.

The number of serials, scientific and literary, received by the university exceeds seven hundred. Including those which are taken by other public institutions of Baltimore, nine hundred periodicals, exclusive of newspapers, are accessible. In the Johns Hopkins University Circular No. 42 a list of those which are received by the university has been printed.

THE MINERALOGICAL CABINET.

The mineralogical cabinet has received no very important additions since the purchase of the Allen and Root collections last year. Several donations and the weekly excursions of the Naturalist's Field Club have considerably increased the

number of specimens from the vicinity of Baltimore, to which one case in the cabinet is especially devoted.

The petrographical cabinet has been enlarged by the purchase of a suite of typical European rocks, numbering over four hundred specimens and also by the acquisition of one of the collections made by Prof. C. H. Hitchcock to illustrate the rocks of New Hampshire, which have been so carefully studied and described by the late Dr. G. W. Hawes.

Several pieces of apparatus, including a new petrographical microscope and a diamond saw for cutting rock-sections, have been added to the mineralogical laboratory.

PUBLICATIONS.

The journals which are published under the auspices of the Trustees, have appeared regularly during the last year, and as far as I am capable of judging are more and more worthy of the financial support they have received from the university chest. The American Journal of Philology and the American Journal of Mathematics, which appear quarterly, and the American Chemical Journal appearing six times during the year, have reached respectively the sixth, the eighth, and the seventh volume. It is interesting to observe that a single number of the mathematical

journal contained seven contributions from writers resident in six different countries. The third volume of the Studies from the Biological Laboratory is in progress. It is devoted exclusively to the original work in biology of those who are or have been connected with this foundation. The Studies in Historical and Political Science do not appear as a journal, but as a series of monographs upon American institutions, contributed partly by members of our own body and partly by other writers. The third volume is nearly complete.

Of the Johns Hopkins University Circulars nine numbers, including 134 pages, were printed during the year. In addition to their use as the ready means of publishing official announcements, the Circulars are the repository of short abstracts of scientific inquiries which are here in progress.

Besides the periodicals above mentioned, the enterprise of one of the Fellows of this institution, A. L. Frothingham, Jr., Ph. D., has led to the commencement of a Journal of Archæology, to be published in Baltimore under his control as a managing editor, with the counsel and aid of prominent members of the American Institute of Archæology, of which it is to be an official organ. This journal is not printed under the auspices of this University and does not receive its financial support, but it is here regarded as

a very important agency in the promotion of American scholarship and as deserving the hearty encouragement of those who are interested in the progress of archæological science.

In this connection reference may be made to a series of exhibitions which were held during the winter under the auspices of the University Archæological Society in one of our halls. A large number of old and rare engravings and original drawings were loaned by Mr. A. L. Frothingham, the plates exhibited being frequently changed. Some interesting Italian antiquities of the Etruscan and Roman periods were also exhibited by him and by Mrs. L. Williams. These exhibitions were attended by our own students and also by many persons not connected with the university. Brief explanatory remarks were often addressed to the assembled company by the secretary of the society.

In the course of the winter, Rev. Dr. C. R. Hale, of Baltimore, while on a visit to Constantinople, secured photographs of three pages of the celebrated book which contains the manuscript "Teaching of the Twelve Apostles." So much interest had been shown in this ancient document, after it was transcribed and printed by Bishop Bryennios,—that the university decided to issue with explanatory notes a small edition of these photographs. They were edited by Prof. J. R. Harris,

and one hundred and twenty-five copies (to which the edition was limited) were quickly distributed. Reference has been made on a previous page to the published report of Sir W. Thomson's lectures.

GRADUATES OF THE YEAR.

Nine undergraduates have come forward to the baccalaureate degree during the year, namely: —

BACHELORS OF ARTS, 1884-85.

John Pendleton Campbell, West Virginia.	Benjamin Titus Roberts, Jr., New York.
John Glenn, Jr., Baltimore.	Moses Roth Ryttenberg, Baltimore.
Junius Moore Horner, North Carolina.	Hugo Steiner, Baltimore.
James Albert Loane, Baltimore.	Henry Hazlehurst Wiegand, Baltimore.
Harry Wilbur Price, District of Columbia.	

Thirteen candidates, who had presented the requisite theses and had also passed the examinations successfully, were made doctors of philosophy, namely:

DOCTORS OF PHILOSOPHY, 1884-85.

Edward Webster Bemis, of Springfield, Mass., A. B., Amherst College, 1880. *Subjects*: History and Political Economy. *Thesis*: Local Government in Michigan and the Northwest.

Gustav Bissing, of Baltimore, A. B., Johns Hopkins University, 1882. *Subjects*: Mathematics and Physics. *Thesis*: Some Notes on Gauss' Coordinates and Steiner's Quartic Surface.

Henry Herbert Donaldson, of New York City, A. B., Yale College, 1879. *Subjects*: Animal Physiology and Histology; Vegetable Physiology. *Thesis*: On the Temperature Sense.

Louis Duncan, of Baltimore, U. S. Naval Academy, 1880. *Subjects*: Physics and Mathematics. *Thesis*: On the Determination of the Ohm by the Lorenz Method.

Homer Winthrop Hillyer, of Waupun, Wis., S. B., University of Wisconsin, 1882. *Subjects*: Chemistry and Physics. *Thesis*: Methods of Determining the Relative Stability of the Fatty Bromides.

Frederic Schiller Lee, of Canton, New York, A. B., St. Lawrence University, 1878, and A. M., 1881. *Subjects*: Animal Physiology and Histology, and Animal Morphology. *Thesis*: On Arterial Tonicity.

Gustav Adolph Liebig, Jr., of Baltimore, A. B., Johns Hopkins University, 1882. *Subjects*: Physics, Mathematics, and Chemistry. *Thesis*: On the Variation of the Specific Heat of Water.

James Playfair McMurrich, of Guelph, Canada, A. B., University of Toronto, 1879, and A. M., 1882. *Subjects*: Animal Morphology, Animal Physiology and Histology, and Vegetable Morphology. *Thesis*: The Osteology and Myology of *Amiurus catus*. (L.) Gill.

Albert Gallatin Palmer, of Baltimore, A. B., Johns Hopkins University, 1882. *Subjects*: Chemistry and Physics. *Thesis*: On the Conduct of p-Diazo-o-Toluene-sulphonic Acid toward Alcohol.

Harry Fielding Reid, of Baltimore, A. B., Johns Hopkins University, 1880. *Subjects*: Physics and Mathematics. *Thesis*: On the Distribution of Energy in the Spectrum of Platinum at Different Temperatures.

Henry Alford Short, of New York City, A. B., Columbia College, 1880. *Subjects*: Greek and Latin. *Thesis*: On the Development and Use of ω Final.

Morrison Isaac Swift, of Ashtabula, Ohio, A. B., Williams College, 1879. *Subjects*: Ethics and History of Philosophy, with Psychology and Political Economy. *Thesis*: On the Ethics of Idealism, as represented by Aristotle and Hegel.

Henry Alfred Todd, of Baltimore, A. B., Princeton College, 1876. *Subjects*: Romance Languages and Sanskrit. *Thesis*: An *editio princeps* of an Old French poem, entitled "Dit de la Panthère."

PERSONAL CHANGES.

Professor J. Rendel Harris, who had requested that the tenure of his office might be limited by an annual appointment, declined re-election at the close of the academic session and returned to his former home in Cambridge, England. He had done much to awaken an interest in the studies to which he was devoted, but in matters which pertain to another department of the University he was not in accord with the policy here pursued and consequently gave up his chair. Corres-

pondence is in progress with a distinguished scholar now in Europe, looking forward to his coming here after the completion of certain work in which he is engaged abroad.

Dr. Henry Wood, Associate in the German Language and Dr. George H. Williams, Associate in Mineralogy have been designated Associate Professors, and Dr. H. A. Todd has been appointed Associate in the Romance Languages.

CHESAPEAKE ZOÖLOGICAL LABORATORY.

The Chesapeake Zoölogical Laboratory maintained its eighth session at Beaufort, N. C. A report of its work is given in the Appendix and abstracts of the scientific work are printed in University Circular, No. 43.

Special attention is called to the Appendix in which,—besides the usual register of names,—statements in respect to courses of lectures and classes will be found, and also a list of papers read before the various societies of the university.

D. C. GILMAN,

President of the Johns Hopkins University.

BALTIMORE, November 2, 1885.

APPENDIX.

A.

Professors, Associates, Etc., 1876-85.

The names in each group are arranged in the order of appointment. The column of dates indicates the period during which the particular station referred to has been held. In consequence of promotions some names appear in several groups.

PRESIDENT.

DANIEL C. GILMAN, 1875-

PROFESSORS.

BASIL L. GILDERSLEEVE, *Greek*, 1876-
 J. J. SYLVESTER, *Mathematics*, 1876-1884.
 IRA REMSEN, *Chemistry*, 1876-
 HENRY A. ROWLAND, *Physics*, 1876-
 H. NEWELL MARTIN, *Biology*, 1876-
 CHARLES D. MORRIS, *Classics, (Collegiate)*, 1876-
 PAUL HAUPT, *Shemitic Languages*, 1883-
 G. STANLEY HALL, *Psychology*, 1884-
 WILLIAM H. WELCH, *Pathology*, 1884-
 SIMON NEWCOMB, *Mathematics and Astronomy*, 1884-

ASSOCIATE PROFESSORS.

HERBERT B. ADAMS, *History*, 1883-
 MAURICE BLOOMFIELD, *Sanskrit*, 1883-
 WILLIAM K. BROOKS, *Morphology*, 1883-
 THOMAS CRAIG, *Applied Mathematics*, 1883-
 CHARLES S. HASTINGS, *Physics*, 1883-1884.
 HARMON N. MORSE, *Chemistry*, 1883-
 WILLIAM E. STORY, *Mathematics*, 1883-
 MINTON WARREN, *Latin*, 1883-
 A. MARSHALL ELLIOTT, *Romance Languages*, 1884-
 J. RENDEL HARRIS, *New Testament Greek*, 1884-1885.
 GEORGE H. WILLIAMS, *Mineralogy*, 1885-
 HENRY WOOD, *German*, 1885-

ASSOCIATES.

JOHN M. CROSS, . . .	<i>Greek,</i>	1876-1881.
PHILIP R. UHLER, . . .	<i>Natural History,</i>	1876-
AUSTIN SCOTT,	<i>History,</i>	1876-1882.
A. MARSHALL ELLIOTT, . .	<i>Romance Philology,</i>	1876-1884.
THOMAS C. MURRAY, . . .	<i>Shemitic,</i>	1876-1879.
HERMAN C. G. BRANDT, . .	<i>German,</i>	1876-1882.
WILLIAM K. BROOKS, . . .	<i>Biology,</i>	1876-1883.
HARMON N. MORSE, . . .	<i>Chemistry,</i>	1876-1883.
ROBERT RIDGWAY,	<i>Natural History,</i>	1876-1877.
WILLIAM E. STORY, . . .	<i>Mathematics,</i>	1876-1883.
ARTHUR W. TYLER, . . .	<i>Librarian,</i>	1876-1878.
CHARLES S. HASTINGS, . .	<i>Physics,</i>	1876-1883.
CHARLES R. LANMAN, . . .	<i>Sanskrit,</i>	1877-1880.
HERBERT B. ADAMS, . . .	<i>History,</i>	1878-1883.
ALBERT S. COOK,	<i>English,</i>	1879-1881.
MINTON WARREN,	<i>Latin,</i>	1879-1883.
WILLIAM HAND BROWNE, . .	<i>Librarian and English,</i>	1879-
HENRY SEWALL,	<i>Biology,</i>	1880-1882.
THOMAS CRAIG,	<i>Mathematics,</i>	1880-1883.
MAURICE BLOOMFIELD, . . .	<i>Sanskrit,</i>	1881-1883.
WILLIAM T. SEDGWICK, . .	<i>Biology,</i>	1881-1883.
HENRY WOOD,	<i>English,</i>	1881-1884.
FABIAN FRANKLIN,	<i>Mathematics,</i>	1882-
RICHARD T. ELY,	<i>Political Economy,</i>	1882-
J. FRANKLIN JAMESON, . . .	<i>History,</i>	1883-
GEORGE H. WILLIAMS, . . .	<i>Mineralogy,</i>	1883-1885.
EDWARD M. HARTWELL, . . .	<i>Physical Training,</i>	1884-
HENRY WOOD,	<i>German,</i>	1884-1885.
ARTHUR L. KIMBALL, . . .	<i>Physics,</i>	1884-
WILLIAM T. COUNCILMAN, . .	<i>Pathology,</i>	1884-
WILLIAM H. HOWELL, . . .	<i>Biology,</i>	1885-
HENRY A. TODD,	<i>Romance Languages,</i>	1885-

LECTURERS.

Most of the persons named as lecturers have given courses of from six to twenty lectures. A few of them have given much longer courses, extending through half the year or through the entire year. In three cases, only single lectures have been given.

SIMON NEWCOMB,	<i>Astronomy,</i>	1876.
LÉONCE RABILLON,	<i>French,</i>	1876-
JOHN S. BILLINGS,	<i>Medical History, etc.,</i>	1877.
FRANCIS J. CHILD,	<i>Chaucer, Ballads, etc.,</i>	1877-1878.
THOMAS M. COOLEY,	<i>Law,</i>	1877-1879.

JULIUS E. HILGARD, . . .	<i>Geodetic Surveys,</i> . . .	1877.
JAMES RUSSELL LOWELL, . . .	<i>Romance Literature,</i> . . .	1877.
JOHN W. MALLETT, . . .	<i>Technological Chemistry,</i> . . .	1877-1878.
FRANCIS A. WALKER, . . .	<i>Political Economy,</i> . . .	1877-1878.
WILLIAM D. WHITNEY, . . .	<i>Comparative Philology,</i> . . .	1877.
WILLIAM F. ALLEN, . . .	<i>History,</i> . . .	1878.
WILLIAM JAMES, . . .	<i>Psychology,</i> . . .	1878.
GEORGE S. MORRIS, . . .	<i>Philosophy,</i> . . .	1878-1885.
J. LEWIS DIMAN, . . .	<i>History,</i> . . .	1879.
H. VON HOLST, . . .	<i>History,</i> . . .	1879.
WILLIAM G. FARLOW, . . .	<i>Botany,</i> . . .	1879.
J. WILLARD GIBBS, . . .	<i>Theoretical Mechanics,</i> . . .	1879.
SIDNEY LANIER, . . .	<i>English Literature,</i> . . .	1879-1881.
CHARLES S. PEIRCE, . . .	<i>Logic,</i> . . .	1879-1884.
JOHN TROWBRIDGE, . . .	<i>Physics,</i> . . .	1880.
A. GRAHAM BELL, . . .	<i>Phonology,</i> . . .	1881.
S. P. LANGLEY, . . .	<i>Physics,</i> . . .	1881.
JOHN MCCRADY, . . .	<i>Biology,</i> . . .	1881.
JAMES BRYCE, . . .	<i>Political Science,</i> . . .	1881.
EDWARD A. FREEMAN, . . .	<i>History,</i> . . .	1881.
JOHN J. KNOX, . . .	<i>Banking,</i> . . .	1881.
ARTHUR CAYLEY, . . .	<i>Mathematics,</i> . . .	1882.
WILLIAM W. GOODWIN, . . .	<i>Plato,</i> . . .	1882.
G. STANLEY HALL, . . .	<i>Psychology,</i> . . .	1882-1884.
RICHARD M. VENABLE, . . .	<i>Constitutional Law,</i> . . .	1882.
JAMES A. HARRISON, . . .	<i>Anglo-Saxon,</i> . . .	1882.
J. RENDEL HARRIS, . . .	<i>New Testament Greek,</i> . . .	1882-1884.
GEORGE W. CABLE, . . .	<i>English Literature,</i> . . .	1883.
WILLIAM W. STORY, . . .	<i>Michel Angelo,</i> . . .	1883.
HIRAM CORSON, . . .	<i>English Literature,</i> . . .	1883-1885.
F. SEYMOUR HADEN, . . .	<i>Etchers and Etching,</i> . . .	1883.
JOHN S. BILLINGS, . . .	<i>Municipal Hygiene,</i> . . .	1883-
JAMES BRYCE, . . .	<i>Roman Law,</i> . . .	1883.
H. VON HOLST, . . .	<i>Political Science,</i> . . .	1883.
WILLIAM TRELEASE, . . .	<i>Botany,</i> . . .	1884.
J. THACHER CLARKE, . . .	<i>Explorations in Assos,</i> . . .	1884.
JOSIAH ROYCE, . . .	<i>Philosophy,</i> . . .	1884.
WILLIAM J. STILLMAN, . . .	<i>Archæology,</i> . . .	1884.
CHARLES WALDSTEIN, . . .	<i>Archæology,</i> . . .	1884.
SIR WILLIAM THOMSON, . . .	<i>Molecular Dynamics,</i> . . .	1884.
A. MELVILLE BELL, . . .	<i>Phonetics, etc.,</i> . . .	1885.
EDMUND GOSSE, . . .	<i>English Literature,</i> . . .	1885.
EUGENE SCHUYLER, . . .	<i>U. S. Diplomacy,</i> . . .	1885.
JUSTIN WINSOR, . . .	<i>Shakespeare,</i> . . .	1885.
FREDERICK WEDMORE, . . .	<i>Modern Art,</i> . . .	1885.

INSTRUCTORS AND ASSISTANTS.

HENRY SEWALL,	<i>Biology,</i>	1876-1878.
SAMUEL F. CLARKE,	<i>Biology,</i>	1879-1881.
FABIAN FRANKLIN,	<i>Mathematics,</i>	1879-1882.
LYMAN B. HALL,	<i>Chemistry,</i>	1879-1880.
CHRISTIAN SIHLER,	<i>Biology,</i>	1879-1880.
HENRY C. ADAMS,	<i>Political Economy,</i>	1879-1881.
THOMAS CRAIG,	<i>Mathematics,</i>	1879-1880.
CHAS. L. WOODWORTH, JR.,	<i>Elocution,</i>	1879-
WILLIAM T. SEDGWICK,	<i>Biology,</i>	1880-1881.
EDWIN H. HALL,	<i>Physics,</i>	1880-1881.
GEORGE H. STOCKBRIDGE,	<i>Latin and German,</i>	1880-1881.
PHILIPPE B. MARCOU,	<i>French,</i>	1880-1883.
HUGH NEWELL,	<i>Drawing,</i>	1880-
R. DORSEY COALE,	<i>Chemistry,</i>	1881-1883.
RICHARD T. ELY,	<i>Political Economy,</i>	1881-1882.
LAWRENCE B. FLETCHER,	<i>Physics,</i>	1881.
GEORGE F. NICOLASSEN,	<i>Greek and Latin,</i>	1881-1882.
BENJAMIN E. SMITH,	<i>Philosophy,</i>	1881-1882.
EDMUND B. WILSON,	<i>Biology,</i>	1881-1882.
JAMES W. BRIGHT,	<i>German,</i>	1882-1883.
J. FRANKLIN JAMESON,	<i>History,</i>	1882-1883.
EDWARD H. SPIEKER,	<i>Greek and Latin,</i>	1882-
HARRY F. REID,	<i>Physics,</i>	1882-1884.
CHARLES F. RADDATZ,	<i>German,</i>	1882-1885.
EDWARD M. HARTWELL,	<i>Physical Training,</i>	1883-1884.
HERBERT W. CONN,	<i>Osteology,</i>	1883-1884.
G. THEODORE DIPPOLD,	<i>German,</i>	1883-1884.
HENRY H. DONALDSON,	<i>Animal Physiology,</i>	1883-1884.
HENRY A. TODD,	<i>Romance Languages,</i>	1883-1885.
OTTO LUGGER,	<i>Curator of Biol. Museum,</i>	1883-1885.
CHARLES A. PERKINS,	<i>Physics,</i>	1884-
WILLIAM H. HOWELL,	<i>Biology,</i>	1884-1885.
EDWARD H. KEISER,	<i>Chemistry,</i>	1884-1885.
J. PLAYFAIR McMURRICH,	<i>Osteology, etc.,</i>	1884-
ALFRED EMERSON,	<i>Archæology,</i>	1884-1885.
EDWARD S. BURGESS,	<i>Botany,</i>	1885.
GEORGE HEMPL,	<i>German,</i>	1884-
JAMES W. BRIGHT,	<i>English,</i>	1885-
HENRY H. DONALDSON,	<i>Psychology,</i>	1885-
JULIUS GOEBEL,	<i>German,</i>	1885-
EDMUND RENOUF,	<i>Chemistry,</i>	1885-

B.

Roll of Fellows.

The following list gives the names of all persons who have been selected by the authorities and appointed to fellowships. Though, in a few cases, by reason of promotion or other causes, the persons designated have not entered upon the fellowships, their names are given to exhibit fully the working of this system of appointment.

The present position or residence of the former holders of fellowships is, in most cases, given after the name.

-
- ✓ HENRY C. ADAMS, PH. D., *Political Science*, 1876-1879.
Associate Professor of Political Economy, Cornell University; Lecturer on Political Economy, University of Michigan.
- HERBERT B. ADAMS, PH. D., *History*, 1876-1878.
Associate Professor of History, Johns Hopkins University.
- WILLIAM K. BROOKS, PH. D., *Biology*, 1876.
Associate Professor of Morphology, and Director of the Chesapeake Zoölogical Laboratory, Johns Hopkins University. (*Appointed Associate before entering on the Fellowship*).
- THOMAS CRAIG, PH. D., *Mathematics*, 1876-1879.
Associate Professor of Applied Mathematics, Johns Hopkins University.
- JOSHUA W. GORE, C. E., *Mathematics*, 1876-1878.
Professor of Natural Philosophy and Engineering, University of North Carolina.
- GEORGE B. HALSTED, PH. D., *Mathematics*, 1876-1878.
Professor of Mathematics, University of Texas.
- EDWARD HART, PH. D., *Chemistry*, 1876-1878.
Assistant Professor of Chemistry, Lafayette College.
- DANIEL W. HERING, C. E., *Engineering*, 1876-1878.
Professor of Mathematics, University of the City of New York.
- MALVERN W. ILES, PH. D., *Chemistry*, 1876-1878.
Chemist, Leadville, Colorado.
- WILLIAM W. JACQUES, PH. D., *Physics*, 1876-1879.
Instructor in Telegraph Engineering, Massachusetts Institute of Technology.
- CHARLES R. LANMAN, PH. D., *Sanskrit*, 1876-1877.
Professor of Sanskrit, Harvard University.
- D. MCGREGOR MEANS, A. B., *Political Science*, 1876-1877.
Late Professor of Political and Mental Science, Middlebury College; Attorney at Law, New York City.
- HARMON N. MORSE, PH. D., *Chemistry*, 1876.
Associate Professor of Chemistry, Johns Hopkins University. (*Appointed Associate before entering upon the Fellowship*).
- WALTER H. PAGE, *Greek*, 1876-1878.
Journalist, Raleigh, N. C.
- P. PORTER POINIER, M. E., *Physics*, 1876.
(*Died without entering upon the Fellowship, June, 1876, aged 23 years*).
- E. DARWIN PRESTON, C. E., *Engineering*, 1876-1878.
U. S. Coast and Geodetic Survey; National Observatory, Cordoba, Argentine Republic.

- HENRY J. RICE, Sc. D., *Biology*, 1876-1878.
Professor of Natural Science, Brooklyn (N. Y.) High School
- JOSIAH ROYCE, PH. D., *Philosophy*, 1876-1878.
Assistant Professor of Philosophy, Harvard University.
- ERNEST G. SIHLER, PH. D., *Greek*, 1876-1879.
Classical Instructor, New York City.
- FREDERICK B. VAN VORST, A. B., *Ethics and Metaphysics*, 1876-1877.
Attorney at Law, New York City.
- JOHN H. WHEELER, PH. D., *Philology*, 1876-1877.
Professor of Greek, University of Virginia.
- SAMUEL F. CLARKE, PH. D., *Biology*, 1876-1879.
Professor of Natural History, Williams College.
- LYMAN B. HALL, PH. D., *Chemistry*, 1877-1879.
Professor of Chemistry and Physics, Haverford College, Pa.
- A. DUNCAN SAVAGE, B. LITT., *Greek*, 1876-1879.
New York City.
- FABIAN FRANKLIN, PH. D., *Mathematics*, 1877-1879.
Associate in Mathematics, Johns Hopkins University.
- CHRISTIAN SIHLER, M. D., PH. D., *Biology*, 1877-1879.
Physician, Cleveland, Ohio.
- FRANCIS G. ALLINSON, PH. D., *Greek and Sanskrit*, . . 1877-1880.
Assistant Professor of Greek and Latin, Haverford College, 1880-82; Classical Instructor, Baltimore.
- MAURICE BLOOMFIELD, PH. D., *Sanskrit and Greek*, . . 1878-1879.
Associate Professor of Sanskrit, Johns Hopkins University.
- CONSTANTINE FAHLBERG, PH. D., *Chemistry*, 1878-1880.
Chemist, Gray's Ferry Chemical Works, Philadelphia.
- EDWIN H. HALL, PH. D., *Physics*, 1878-1880.
Instructor in Physics, Harvard University.
- EDWARD COLES HARDING, A. M., *Greek*, 1878-1879.
Professor of Greek, University of Louisiana, 1879-80.
- ISAAC OTT, M. D., *Biology*, 1878-1879.
Physician, Easton, Pa.
- HENRY SEWALL, PH. D., *Biology*, 1878-1879.
Professor of Physiology, University of Michigan.
- WASHINGTON I. STRINGHAM, PH. D., . . . *Mathematics*, 1878-1880.
Professor of Mathematics, University of California.
- ABRAM V. E. YOUNG, PH. B., *Chemistry*, 1878-1880.
Professor of Chemistry, Northwestern University.
- CHARLES R. HEMPHILL, A. M., D. D., . . . *Greek*, 1878-1879.
Late Associate Professor of Biblical Literature, Theological Seminary, Columbia, S. C.; Clergyman, Louisville, Ky.
- ALLAN MARQUAND, PH. D., *Logic and Ethics*, . . 1877-1880.
Professor of the History of Art, Princeton College.
- CHARLES A. VAN VELZER, S. B., *Mathematics*, 1878-1881.
Assistant Professor of Mathematics, University of Wisconsin.
- BROWN AYRES, S. B., *Physics*, 1879-1880.
Professor of Physics, Tulane University, New Orleans.
- LOUIS BEVIER, PH. D., *Greek*, 1879-1881.
Instructor in French in Rutgers College.
- EDWARD M. HARTWELL, M. D., PH. D., . . *Biology*, 1879-1881.
Associate in Physical Training, Johns Hopkins University.

- JOHN R. McD. IRBY, PH. D., . . . *Mineralogy*, . . . 1879-1880.
(*Died March 25, 1880, aged 25 years.*)
- MITSURU KUHARA, PH. D., . . . *Chemistry*, . . . 1879-1881.
Lecturer on Organic Chemistry, University of Tokio, Japan.
- OSCAR H. MITCHELL, PH. D., . . . *Mathematics*, . . . 1879-1882.
Professor of Mathematics, Marietta College, Ohio.
- EDWARD L. NICHOLS, PH. D., . . . *Physics*, . . . 1879-1880.
Professor of Physics and Chemistry, University of Kansas.
- WALDO S. PRATT, A. M., . . . *Aesthetics etc.*, . . . 1879-1880.
Instructor in Ecclesiastical Music, Theological Seminary, Hartford, Conn.
- WILLIAM T. SEDGWICK, PH. D., . . . *Biology*, . . . 1879-1880.
Assistant Professor of Biology, Massachusetts Institute of Technology.
- HERMAN VOORHEES, C. E., . . . *Chemistry*, . . . 1879.
(*Died without entering on the Fellowship, October 14, 1879, aged 27 years.*)
- CHARLES O. WHITMAN, PH. D., . . . *Biology*, . . . 1879.
Professor of Zoölogy, University of Tokio, Japan, 1879-81; Marine Station, Naples, 1881-82; Assistant, Museum of Comparative Zoölogy, Cambridge, Mass. (*Resigned before entering on the Fellowship.*)
- EDMUND B. WILSON, PH. D., . . . *Biology*, . . . 1879-1881.
Associate Professor of Biology, Bryn Mawr College, Pa.
- GEORGE F. NICOLASSEN, PH. D., . . . *Greek*, . . . 1879-1881.
Professor of Greek and Latin, Southwestern Presbyterian University, Tenn.
- WILLIAM BURNLEY, PH. D., . . . *Chemistry*, . . . 1879-1880.
Professor of Chemistry, South Carolina Agricultural College, Columbia.
- ROBERT W. PRENTISS, S. B., . . . *Mathematics*, . . . 1879-1881.
Office of U. S. Nautical Almanac, Washington, D. C.
- JAMES W. BRIGHT, PH. D., . . . *Teutonic Languages*, . . . 1880-1882.
Instructor in English, Johns Hopkins University.
- BENJAMIN C. BURT, A. M., . . . *Philosophy*, . . . 1880-1881.
Assistant Professor of English and Rhetoric, University of Michigan.
- SPENCER H. FREEMAN, A. M., . . . *Physics*, . . . 1880-1882.
Professor of Physics and Astronomy, Adelbert College, Western Reserve University, Ohio.
- KAKICHI MITSUKURI, PH. D., . . . *Biology*, . . . 1880-1881.
Professor of Zoölogy, University of Tokio, Japan.
- BERNARD F. O'CONNOR, PH. D., . . . *Romance Languages*, . . . 1880-1882.
Instructor in French, Columbia College.
- CHASE PALMER, PH. D., . . . *Chemistry*, . . . 1880-1882.
Professor of Chemistry, Massachusetts State Normal School, Salem.
- HERBERT M. PERRY, A. B., . . . *Mathematics*, . . . 1880-1882.
Instructor in Mathematics, Cascadilla School, Ithaca, N. Y.
- WILLIAM L. ROWLAND, S. B., . . . *Chemistry*, . . . 1880.
(*Did not enter upon the Fellowship.*)
- EDWARD H. SPIEKER, PH. D., . . . *Greek*, . . . 1880-1882.
Instructor in Greek and Latin, Johns Hopkins University.
- MORRISON I. SWIFT, PH. D., . . . *Philosophy*, . . . 1880-1882.
Instructor in Logic and Political Economy, Hobart College, 1882-84.
- ARTHUR W. WHEELER, A. B., . . . *Physics*, . . . 1880-1881.
(*Died, January 6, 1881, aged 21 years.*)
- R. DORSEY COALE, PH. D., . . . *Chemistry*, . . . 1880-1881.
Professor of Chemistry and Toxicology, University of Maryland.
- A. F. WILHELM SCHIMPER, PH. D., . . . *Biology*, . . . 1880-1881.
Privat-Dozent, University of Bonn, Germany.

- LAWRENCE B. FLETCHER, PH. D., . . . *Physics*, . . . 1880-1881.
Instructor in Physics, Wesleyan University, Middletown, Conn., 1882-83.
- WILLIAM J. ALEXANDER, PH. D., . . . *Greek*, . . . 1881-1883.
Professor of English, Dalhousie College, Halifax, Nova Scotia.
- EDWARD S. BURGESS, A. B., . . . *Greek*, . . . 1881-1882.
Instructor, Washington (D. C.) High School.
- WILLIAM J. COMSTOCK, PH. B., . . . *Chemistry*, . . . 1881-1882.
Student of Chemistry, University of Munich.
- WILLIAM C. DAY, PH. D., . . . *Chemistry*, . . . 1881-1883.
Professor of Chemistry and Physics, University of Nashville, Tenn.
- HENRY H. DONALDSON, PH. D., . . . *Biology*, . . . 1881-1883.
Instructor in Psychology, Johns Hopkins University.
- WILLIAM P. DURFEE, PH. D., . . . *Mathematics*, . . . 1881-1883.
Professor of Mathematics, Hobart College, N. Y.
- GEORGE S. ELY, PH. D., . . . *Mathematics*, . . . 1881-1883.
Professor of Mathematics, Buchtel College, 1883-84; Assistant Examiner, U. S. Patent Office.
- J. FRANKLIN JAMESON, PH. D., . . . *History*, . . . 1881-1882.
Associate in History, Johns Hopkins University.
- C. HERSCHEL KOYL, A. B., . . . *Physics*, . . . 1881-1883.
Instructor in Physics, Washington (D. C.) High School.
- HENRY L. OSBORN, PH. D., . . . *Biology*, . . . 1881-1882.
Professor of Zoology, Purdue University, Lafayette, Indiana.
- HENRY N. STOKES, PH. D., . . . *Biology*, . . . 1881-1883.
Student of Chemistry in Germany.
- BENJAMIN W. WELLS, PH. D., . . . *English*, . . . 1881.
Instructor in English, Friends' School, Providence, R. I.
- BENJAMIN I. GILMAN, A. B., . . . *Logic*, . . . 1881-1882.
Student of Philosophy in Europe.
- CHARLES J. BELL, A. B., . . . *Chemistry*, . . . 1882.
Professor of Chemistry, Pennsylvania State College, 1882-85; Fellow by Courtesy, Johns Hopkins University. (*Did not enter upon the Fellowship*).
- JAMES M. CATTELL, A. B., . . . *Philosophy*, . . . 1882-1883.
Student of Philosophy in Germany.
- ELLERY W. DAVIS, PH. D., . . . *Mathematics*, . . . 1882-1884.
Professor of Mathematics and Military Tactics, Florida Agricultural College.
- DAVID T. DAY, PH. D., . . . *Chemistry*, . . . 1882-1884.
Johns Hopkins University.
- ALFRED EMERSON, PH. D., . . . *Greek*, . . . 1882-1884.
Instructor in Classical Archaeology, Johns Hopkins University, 1884-85; Fellow by Courtesy, Johns Hopkins University.
- WILLIAM S. FLEMING, A. B., . . . *Greek*, . . . 1882-1883.
Professor of Greek and German, Davidson College, 1883-85.
- ARTHUR L. FROTHINGHAM, JR., PH. D., *Shemitic Languages*, . . . 1882-1885.
Fellow by Courtesy, Johns Hopkins University; Editor of the American Journal of Archaeology.
- HENRY R. GODNOW, A. B., . . . *Physics*, . . . 1882-1883.
- ELGIN R. L. GOULD, A. B., . . . *History*, . . . 1882-1884.
Instructor in History, Washington (D. C.) High School.
- ARTHUR S. HATHAWAY, S. B., . . . *Mathematics*, . . . 1882-1884.
Instructor in Mathematics, Cornell University, N. Y.

WILLIAM H. HOWELL, PH. D.,	<i>Biology,</i>	. . . . .	1882-1884.
Associate in Biology, Johns Hopkins University.			
ARTHUR L. KIMBALL, PH. D.,	<i>Physics,</i>	. . . . .	1882-1883.
Associate in Physics, Johns Hopkins University.			
HARRY F. REID, PH. D.,	<i>Physics,</i>	. . . . .	1882.
Student of Physics in Cambridge, England.			
EDWARD H. KEISER, PH. D.,	<i>Chemistry,</i>	. . . . .	1882-1884.
Associate Professor of Chemistry, Bryn Mawr College, Pa.			
WILLIAM M. ARNOLT, B. D.,	<i>Greek,</i>	. . . . .	1883-1885.
Fellow by Courtesy, Johns Hopkins University.			
GUSTAV BISSING, PH. D.,	<i>Mathematics,</i>	. . . . .	1883-1884.
Assistant Examiner, U. S. Patent Office.			
ADAM T. BRUCE, A. B.,	<i>Biology,</i>	. . . . .	1883-1884.
Fellow by Courtesy, Johns Hopkins University.			
ARCHIBALD L. DANIELS, A. B.,	<i>Mathematics,</i>	. . . . .	1883-1884.
Instructor in Mathematics, Chicago Manual Training School.			
✓ JOHN DEWEY, PH. D.,	<i>Philosophy,</i>	. . . . .	1883-1884.
Instructor in Philosophy, University of Michigan.			
JAMES R. DUGGAN, M. D., PH. D.,	<i>Chemistry,</i>	. . . . .	1883-1884.
Fellow by Courtesy, Johns Hopkins University.			
HANS C. G. VON JAGEMANN, PH. D.,	<i>Modern Languages,</i>	. . . . .	1883-1884.
Professor of Modern Languages, Earlham College, Richmond, Ind.			
GUSTAV A. LIEBIG, JR., PH. D.,	<i>Physics,</i>	. . . . .	1883-1885.
Fellow by Courtesy, Johns Hopkins University.			
C. W. EMIL MILLER, A. B.,	<i>Greek,</i>	. . . . .	1883-1885.
Fellow by Courtesy, Johns Hopkins University.			
CHARLES A. PERKINS, PH. D.,	<i>Physics,</i>	. . . . .	1883-1884.
Assistant in Physics, Johns Hopkins University.			
LEWIS T. STEVENS, A. B.,	<i>Biology,</i>	. . . . .	1883-1884.
Student of Medicine, Harvard University.			
LEWIS W. WILHELM, PH. D.,	<i>History,</i>	. . . . .	1883-1884.
Baltimore.			
HOMER W. HILLYER, PH. D.,	<i>Chemistry,</i>	. . . . .	1884-1885.
Assistant in Chemistry, University of Wisconsin.			
FREDERIC S. LEE, PH. D.,	<i>Biology,</i>	. . . . .	1884-1885.
Student of Biology in Germany.			
CHARLES H. LEVERMORE, A. B.,	<i>History,</i>	. . . . .	1884-1885.
New Haven, Conn.			
HENRY F. NACHTRIEB, S. B.,	<i>Biology,</i>	. . . . .	1884-1885.
Assistant Professor of Biology, University of Minnesota, Minneapolis.			
HENRY B. NIXON,	<i>Mathematics,</i>	. . . . .	1884-1885.
Fellow by Courtesy, Johns Hopkins University.			
WILLIAM NOYES, JR., A. B., M. D.,	<i>Psychology,</i>	. . . . .	1884-1885.
Fellow by Courtesy, Johns Hopkins University.			
ALBERT G. PALMER, PH. D.,	<i>Chemistry,</i>	. . . . .	1884-1885.
Assistant in Chemistry, Swarthmore College, Pa.			
ALBERT H. TOLMAN, A. B.,	<i>English,</i>	. . . . .	1884.
Professor of English Literature and Rhetoric, in Ripon College, Wisc. (<i>Resigned before entering on the Fellowship</i>).			
WOODROW WILSON, A. B.,	<i>History,</i>	. . . . .	1884-1885.
Associate in History, Bryn Mawr College, Pa.			

- ARTHUR McDONALD, A. B., . . . *Psychology*, . . . 1885.
(Resigned before entering on the Fellowship).
- CHARLES B. WRIGHT, A. B., . . . *English*, . . . 1885.
 Professor of English Literature and Rhetoric, in Middlebury College, Vt. *(Resigned before entering on the Fellowship).*

PRESENT HOLDERS OF FELLOWSHIPS.

CYRUS ADLER, A. B., . . .	<i>Shemitic Languages</i> , . . .	1885-
ETHAN A. ANDREWS, PH. B., . . .	<i>Biology</i> , . . .	1884-
DAVID BARCROFT, PH. B., . . .	<i>Mathematics</i> , . . .	1885-
W. SHIRLEY BAYLEY, A. B., . . .	<i>Geology & Petrography</i> , . . .	1885-
LOUIS BELL, A. B., . . .	<i>Physics</i> , . . .	1885-
FRANK A. CHRISTIE, A. B., . . .	<i>Greek</i> , . . .	1885-
HENRY CREW, A. B., . . .	<i>Physics</i> , . . .	1884-
DAVIS R. DEWEY, A. B., . . .	<i>History</i> , . . .	1885-
ALBERT E. EGGE, A. B., . . .	<i>Teutonic Languages</i> , . . .	1885-
WILLIAM H. EMERSON, . . .	<i>Chemistry</i> , . . .	1885-
JOHN C. FIELDS, A. B., . . .	<i>Mathematics</i> , . . .	1885-
ABEL H. HUIZINGA, A. B., . . .	<i>Shemitic Languages</i> , . . .	1884-
JOSEPH JASTROW, A. B., . . .	<i>Psychology</i> , . . .	1885-
GEORGE T. KEMP, A. B., . . .	<i>Biology</i> , . . .	1885-
MARION D. LEARNED, A. B., . . .	<i>Modern Languages</i> , . . .	1885-
GONZALEZ LODGE, A. B., . . .	<i>Greek</i> , . . .	1885-
CHARLES S. PALMER, A. B., . . .	<i>Chemistry</i> , . . .	1885-
ERNEST M. PEASE, A. B., . . .	<i>Latin</i> , . . .	1884-
CHARLES WHETHAM, A. B., . . .	<i>Romance Languages</i> , . . .	1885-

C.
Graduates.

DEGREES CONFERRED HONORIS CAUSA.

1880.

HENRY A. ROWLAND, PH. D., Professor of Physics, Johns Hopkins University.

1881.

RUTHERFORD B. HAYES, LL. D., President of the United States.

DEGREES CONFERRED ON EXAMINATION.

1878.

DOCTORS OF PHILOSOPHY.

HENRY CARTER ADAMS. (F). A. B., Iowa, 1874.—Lecturer on Political Economy, University of Michigan; Associate Professor of Political Economy, Cornell University.

THOMAS CRAIG. (F). C. E., Lafayette, 1875.—Associate Professor of Mathematics, Johns Hopkins University.

JOSIAH ROYCE. (F). A. B., Univ. of California, 1875.—Assistant Professor of Philosophy, Harvard University.

ERNEST GOTTLIEB SIHLER. (F). Concordia, 1869.—Classical Instructor, New York City. (4)

1879.

DOCTORS OF PHILOSOPHY.

MAURICE BLOOMFIELD. (F). A. M., Furman, 1877.—Associate Professor of Sanskrit, Johns Hopkins University.

SAMUEL FESSENDEN CLARKE. (F). Ph. B., Yale, 1878.—Professor of Natural History, Williams College.

GEORGE BRUCE HALSTED. (F). A. B., Princeton, 1875.—Professor of Mathematics, University of Texas.

EDWARD HART. (F). S. B., Lafayette, 1874.—Assistant Professor of Chemistry, Lafayette College.

WILLIAM WHITE JACQUES. (F). S. B., Mass. Inst. of Technology, 1876.—Instructor in Telegraph Engineering, Massachusetts Institute of Technology.

HENRY SEWALL. (F). S. B., Wesleyan, 1876.—Professor of Physiology, University of Michigan. (6)

F. Holders of Fellowships.

BACHELORS OF ARTS.

- GEORGE WASHINGTON MCCREARY. Engaged in mercantile pursuits, Baltimore.
 CHASE PALMER. (F). Professor of Chemistry, Massachusetts State Normal School.
 EDWARD HENRY SPIEKER. (F). Instructor in Greek and Latin, Johns Hopkins University. (3)

1880.

DOCTORS OF PHILOSOPHY.

- FRANCIS GREENLEAF ALLINSON. (F). A. B., Haverford, 1876; A. B., Harvard, 1877.—Late Assistant Professor of Greek and Latin, Haverford College; Classical Instructor, Baltimore.
 FABIAN FRANKLIN. (F). Ph. B., Columbian, 1869.—Associate in Mathematics, Johns Hopkins University.
 EDWIN HERBERT HALL. (F). A. B., Bowdoin, 1875.—Instructor in Physics, Harvard University.
 ALLAN MARQUAND. (F). A. B., Princeton, 1874.—Professor of the History of Art, Princeton College.
 WASHINGTON IRVING STRINGHAM. (F). A. B., Harvard, 1877.—Professor of Mathematics, University of California. (5)

BACHELORS OF ARTS.

- THOMAS MILTON BEADENKOPF. Student of Theology, Yale College.
 ALLEN KERR BOND. M. D., University of Maryland, 1882.—Physician, Baltimore.
 WILLIAM CATHCART DAY. (F). Professor of Chemistry and Physics, University of Nashville, Tenn.
 HENRY LAURENCE GANTT. M. E., Stevens Institute of Technology, 1884.—Mechanical Engineer, Baltimore.
 EDGAR GOODMAN. LL. B., University of Maryland, 1881.—Attorney at Law, Baltimore.
 CARL ECKHARDT GRAMMER. Minister of the Protestant Episcopal Church, Hancock, Md.
 ALEXANDER FRIDGE JAMIESON. Instructor, Lawrenceville, N. J.
 *EDMUND ALLEN JARVIS. Died October 15, 1880, aged 22 years.
 STEWART BRIAN LINTHICUM. LL. B., University of Maryland, 1882.—Attorney at Law, Portland, Oregon.
 JOHN HANSON LOWE. LL. B., University of Maryland, 1882.—Attorney at Law, Baltimore.
 LEIGH CLINTON MORGAN. Minister of the Protestant Episcopal Church, Brooklyn, N. Y.
 NELSON PALMER. Engaged in mercantile pursuits, Baltimore.
 THOMAS PETTIGREW. Creswell, N. C.
 HARRY FIELDING REID. (F). Assistant in Physics, Johns Hopkins University, 1882-84.—Now Student of Physics in Cambridge, England.
 WILTZ RAYMOND STRICKLEN. Minister of the Methodist Episcopal Church, Baltimore.
 LEWIS WEBB WILHELM. (F). Baltimore. (16)

1881.

DOCTORS OF PHILOSOPHY.

- LOUIS BEVIER. (F). A. B., Rutgers, 1878.—Instructor in French in Rutgers College.
- ROBERT DORSEY COALE. (F). Professor of Chemistry and Toxicology, University of Maryland.
- EDWARD ALLEN FAY. A. B., University of Michigan, 1882.—Professor of History and Languages, National Deaf-Mute College.
- LAWRENCE BUNTING FLETCHER. (F). A. B., Columbia, 1877.—Instructor in Physics, Wesleyan University, 1882-84.
- SAMUEL GARNER. A. B., St. John's, 1871.—Professor of Modern Languages, University of Indiana.
- EDWARD MUSSEY HARTWELL. (F). A. B., Amherst, 1873; M. D., Miami Medical College, 1882.—Associate in Physical Training, Johns Hopkins University.
- WILLIAM THOMPSON SEDGWICK. (F). Ph. B., Yale, 1877.—Assistant Professor of Biology, Massachusetts Institute of Technology.
- CHRISTIAN SIHLER. (F). Concordia, 1866; M. D., University of Michigan, 1871.—Physician, Cleveland, O.
- EDMUND BEECHER WILSON. (F). Ph. B., Yale, 1878.—Lecturer on Biology, Williams College, 1883-84; Associate Professor of Biology, Bryn Mawr College, Pa. (9)

BACHELORS OF ARTS.

- WILLIAM WILSON BADEN. LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.
- HENRY JOHNS BOWDOIN. LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.
- JOHN WILSON BROWN. Baltimore.
- DAVID TALBOTT DAY. (F). Johns Hopkins University.
- WILLIAM HENRY HOWELL. (F). Associate in Biology, Johns Hopkins University.
- JOHN JOHNSON. Instructor, McDonogh School.
- JAMES EDWARD KEELER. Assistant, Allegheny (Pa.) Astronomical Observatory.
- EDWIN GEORGE RICHARDSON. Clergyman of the Protestant Episcopal Church, Milwaukee, Wis.
- ADONIRAM JUDSON ROBINSON. LL. B., University of Maryland, 1885.—Instructor in Baltimore City College.
- HENRY ROLANDO. M. D., University of Maryland, 1883.—Now connected with the Presbyterian Hospital, New York City.
- LEE SALE. LL. B., Washington University, 1883.—Attorney at Law, St. Louis, Mo.
- MACTIER WARFIELD. M. D., University of Maryland, 1884.—Physician, Baltimore. (12)

1882.

DOCTORS OF PHILOSOPHY.

- JAMES WILSON BRIGHT. (F). A. B., Lafayette, 1877.—Instructor in English, Johns Hopkins University.
- JOHN FRANKLIN JAMESON. (F). A. B., Amherst, 1879.—Associate in History, Johns Hopkins University.

- MITSURU KUHARA. (F). S. B., University of Tokio, 1877.—Lecturer on Organic Chemistry, University of Tokio.
- ROBERT W. MAHON. C. E., Lehigh, 1876.—Adjunct Professor of Chemistry, Lafayette College, 1882-83; Chemist, Camden, N. J.
- OSCAR HOWARD MITCHELL. (F). A. B., Marietta, 1875.—Professor of Mathematics, Marietta College.
- GEORGE FREDERICK NICOLARSEN. (F). A. B., University of Virginia, 1879.—Professor of Ancient Languages, Southwestern Presbyterian University.
- WILLIAM ALBERT NOYES. A. B., Iowa, 1879.—Professor of Chemistry, University of Tennessee.
- CHASE PALMER. (F). A. B., Johns Hopkins, 1879.—Professor of Chemistry, Mass. State Normal School.
- EDWARD HENRY SPIEKER. (F). A. B., Johns Hopkins, 1879.—Instructor in Greek and Latin, Johns Hopkins University. (9)

BACHELORS OF ARTS.

- WILLIAM HUGHLETT ADKINS. LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.
- THOMAS ALEXIS BERRY. Graduate Student, Johns Hopkins University.
- GUSTAV BISSING. (F). Fellow, Johns Hopkins University, 1888-84.—Assistant Examiner, U. S. Patent Office.
- WALTER BERNARD CLARKSON. Principal of the Duval High School, Jacksonville, Fla., 1880-83.
- HERMANN LOUIS EBELING. Instructor, Bloomfield, N. J.
- LOUIS GARTHE. Baltimore.
- EDWARD INGLE. Baltimore.
- RICHARD FULLER KIMBALL. LL. B., University of Maryland, 1884.—Attorney at Law, Baltimore.
- GUSTAV ADOLPH LIEBIG, JR. (F). Fellow by Courtesy, Johns Hopkins University.
- CHARLES WILLIAM EMIL MILLER. (F). Johns Hopkins University.
- JAMES PAGE. Baltimore.
- ALBERT GALLATIN PALMER. (F). Assistant in Chemistry, Swarthmore College, Pa.
- ROBERT MILLER REESE. Engaged in mercantile pursuits, Baltimore.
- LEWIS TEBBETTS STEVENS. (F). Student of Medicine, Harvard University.
- HERBERT THORNDYKE TIFFANY. LL. B., University of Maryland, 1885.—Attorney at Law, Baltimore. (15)

1883.

DOCTORS OF PHILOSOPHY.

- WILLIAM JOHN ALEXANDER. (F). A. B., University of London, 1876.—Professor of English Literature, Dalhousie College, Nova Scotia.
- WILLIAM CATHCART DAY. (F). A. B., Johns Hopkins University, 1890.—Professor of Chemistry and Physics, University of Nashville, Tennessee.
- WILLIAM PITT DUFEE. (F). A. B., University of Michigan, 1876.—Professor of Mathematics, Hobart College.

GEORGE STETSON ELY. (F). A. B., Amherst College, 1878; Professor of Mathematics, Buchtel College, 1883-84.—Assistant Examiner, U. S. Patent Office.

KAKICHI MITSUKURI. (F). Ph. B., Yale College, 1879.—Professor of Zoölogy, University of Tokio, Japan.

BERNARD FRANCIS O'CONNOR. (F). Bach. ès Lettres, Université de France, 1874.—Instructor in French, Columbia College. (6)

BACHELORS OF ARTS.

WILLIAM SHIRLEY BAYLEY. Fellow, Johns Hopkins University.

MAURICE FELS. Student of Law, Philadelphia.

DAVID STERRETT GITTINGS. Student of Law, Baltimore.

WILLIAM BEATTY HARLAN. LL. B., University of Maryland, 1885.—Attorney at Law, Baltimore.

GEORGE THEOPHILUS KEMP. Fellow, Johns Hopkins University.

GONZALEZ LODGE. Fellow, Johns Hopkins University.

WILLIAM EDGAR STRATTON. Student of Medicine, Harvard University.

HENRY WINSLOW WILLIAMS. LL. B., University of Maryland, 1885.—Attorney at Law, Baltimore.

HENRY VAN PETERS WILSON. Graduate Scholar, Johns Hopkins University.

WILLIAM JOHN WITZENBACHER. Instructor in the McDonogh School. (10)

1884.

DOCTORS OF PHILOSOPHY.

HERBERT WILLIAM CONN. A. B., Boston University, 1881.—Professor of Zoölogy, Wesleyan University, Conn.

ELLERY WILLIAM DAVIS. (F). S. B., University of Wisconsin, 1879.—Professor of Mathematics and Military Tactics, Florida Agricultural College.

DAVID TALBOTT DAY. (F). A. B., Johns Hopkins, 1881.—Graduate Student, Johns Hopkins University.

JOHN DEWEY. (F). A. B., University of Vermont, 1879.—Instructor in Philosophy, University of Michigan.

JAMES REYNOLDS DUGGAN. (F). A. B., Mercer University, 1877.—Fellow by Courtesy, Johns Hopkins University.

WILLIAM HENRY HOWELL. (F). A. B., Johns Hopkins, 1881.—Associate in Biology, Johns Hopkins University.

HANS CARL GÜNTHER VON JAGEMANN. (F). Naumburg Gymnasium, 1876.—Professor of Modern Languages, Earlham College.

EDWARD HARRISON KEISER. (F). S. B., Swarthmore, 1880.—Associate Professor of Chemistry, Bryn Mawr College, Pa.

ARTHUR LALANDE KIMBALL. (F). A. B., Princeton, 1881.—Associate in Physics, Johns Hopkins University.

HENRY LESLIE OSBORN. (F). A. B., Wesleyan, 1878.—Professor of Zoölogy, Purdue University, Indiana.

CHARLES ALBERT PERKINS. (F). A. B., Williams, 1879.—Assistant in Physics, Johns Hopkins University.

ALBERT SHAW. A. B., Iowa College, 1879.—Journalist, Minneapolis, Minnesota.

- HENRY NEWLIN STOKES. (F). S. B., Haverford, 1879.—Student of Chemistry in Europe.
- LEWIS WEBB WILHELM. (F). A. B., Johns Hopkins, 1880.—Baltimore.
- ARTHUR YAGER. A. B., Georgetown College, Kentucky, 1879.—Professor of History, Georgetown College, Ky. (15)

BACHELORS OF ARTS.

- ALBERT CLAYTON APPLEGARTH. Graduate Student, Johns Hopkins University.
- CHARLES WALTER ARTZ. Student of Law, Columbia College.
- WALTER BLISS CANFIELD. Graduate Student, Johns Hopkins University.
- GEORGE GIBSON CAREY, JR. Student of Law, University of Maryland.
- WILLIAM KENNEDY CROMWELL. Student of Law, Harvard University.
- CHARLES WILLIAM RAMMELSBERG CRUM. Instructor in Mathematics, Mercersburg College, Pa.
- HARRY FRIEDENWALD. Student of Medicine, College of Physicians and Surgeons, Baltimore.
- WILLIAM LINDSAY GLENN. Student of Law, University of Maryland.
- JOHN HINKLEY. Student of Law, University of Maryland.
- CHARLES HOWARD HOWARD. Student of Law, University of Maryland.
- JOHN DEERING LORD, JR. Student of Law, Columbia College.
- JERE WILLIAMS LORD. Student of Medicine, University of Pennsylvania.
- WILLIAM PATRICK LYONS. Student of Law, University of Maryland.
- EDGAR GEORGE MILLER, JR. Student of Law, University of Maryland.
- WILLIAM RIDGELY ORNDORFF. Graduate Scholar, Johns Hopkins University.
- GEORGE DOBBIN PENNIMAN. Student of Law, University of Maryland.
- WILLIAM HENRY PERKINS, JR. Student of Law, University of Maryland.
- GEORGE CLEMENT STOKES, JR. Baltimore.
- WILLIAM JONES THOMAS. (*Deceased, March 9, 1885*).
- WILLIAM FERDINAND WALZ. Graduate Student, Johns Hopkins University.
- FREDERICK HENRY WILKENS. Student in the University of Berlin, Germany.
- GEORGE WISHART EDMOND, (*extra ordinem*). Graduate Student, Johns Hopkins University.
- CHARLES HOWARD SHINN, (*extra ordinem*). San Francisco, California. (22)

1885.

DOCTORS OF PHILOSOPHY.

- EDWARD WEBSTER BEMIS. A. B., Amherst College, 1880.—Instructor, Minneapolis, Minn.
- GUSTAV BISSING. (F). A. B., Johns Hopkins University, 1882.—Assistant Examiner, U. S. Patent Office.
- HENRY HERBERT DONALDSON. (F). A. B., Yale College, 1879.—Instructor in Psychology, Johns Hopkins University.
- LOUIS DUNCAN. U. S. Naval Academy, 1880.—U. S. Navy.

- HOMER WINTHROP HILLYER. (F). S. B., University of Wisconsin, 1882.—Assistant in Chemistry, University of Wisconsin.
- FREDERIC SCHILLER LEE. (F). A. B., St. Lawrence University, 1878.—Student of Biology in Germany.
- GUSTAV ADOLPH LIEBIG, JR. (F). A. B., Johns Hopkins University, 1882.—Fellow by Courtesy, Johns Hopkins University.
- JAMES PLAYFAIR MCMURRICH. A. B., University of Toronto, 1879.—Instructor in Osteology and Mammalian Anatomy, Johns Hopkins University.
- ALBERT GALLATIN PALMER. (F). A. B., Johns Hopkins University, 1882.—Assistant in Chemistry, Swarthmore College, Pa.
- HARRY FIELDING REID. (F). A. B., Johns Hopkins University, 1880.—Student of Physics, University of Cambridge, England.
- HENRY ALFORD SHORT. A. B., Columbia College, 1880.—Fellow of Columbia College.
- MORRISON ISAAC SWIFT. (F). A. B., Williams College, 1879.—Ashtabula, Ohio.
- HENRY ALFRED TODD. A. B., Princeton College, 1876.—Associate in Romance Languages, Johns Hopkins University. (13)

BACHELORS OF ARTS.

- JOHN PENDLETON CAMPBELL. Graduate Scholar, Johns Hopkins University.
- JOHN GLENN, JR. Student of Law, University of Maryland.
- JUNIUS MOORE HORNER. Graduate Scholar, Johns Hopkins University.
- JAMES ALBERT LOANE. Graduate Scholar, Johns Hopkins University.
- HARRY WILBUR PRICE. Washington, D. C.
- BENJAMIN TITUS ROBERTS, JR. Graduate Student, Johns Hopkins University.
- MOSES ROTH RYTTEBERG. Graduate Student, Johns Hopkins University.
- HUGO STEINER. Graduate Student, Johns Hopkins University.
- HENRY HAZLEHURST WIEGAND. Graduate Student, Johns Hopkins University. (9)

TOTAL (1878-85).

DOCTORS OF PHILOSOPHY,	67
BACHELORS OF ARTS,	88

D.

Reports on the Studies of the Year.

PREPARED BY THE PROFESSORS AND INSTRUCTORS OF THE SEVERAL
DEPARTMENTS.

MATHEMATICS.

The following courses of lectures, etc., have been given during the year:

Professor Newcomb:

Analytical and Celestial Mechanics. *Twice weekly, through the year.*
Seminary. *Weekly, second half-year.*

Dr. Story:

Seminary. *Weekly, through the year.*
Theory of Numbers. *Twice weekly, first half-year.*
Quaternions. *Three times weekly, second half-year.*
Modern Synthetic Geometry. *Three times weekly, first half-year.*
Modern Algebra. *Twice weekly, second half-year.*
Introductory Course for Graduates. *Daily, through the year.*
Conic Sections. *Twice weekly, through the year.*

Dr. Craig:

Seminary. *Weekly, through the year.*
Calculus of Variations. *Twice weekly, first half-year.*
Differential Equations. *Twice weekly, through the year.*
Theory of Functions. *Three times weekly, through the year.*
Hydrodynamics. *Three times weekly, first half-year.*
Linear Differential Equations. *Three times weekly, second half-year.*

Dr. Franklin:

Problems in Mechanics. *Twice weekly, through the year.*
Theory of Equations. *Three times weekly, first half-year.*
Differential and Integral Calculus. *Three times weekly, through the year.*
Solid Analytic Geometry. *Three times weekly, second half-year.*
Analytical Geometry. *Twice weekly, first half-year; three times weekly, second half-year.*
Trigonometry. *Three times weekly, first half-year.*

Mr. Nixon:

Differential and Integral Calculus (specially designed for students of Physics). *Daily, first half-year.*

PHYSICS.

The rooms devoted to the Physical Laboratory have been open daily for the prosecution of study and research, under the direction of Professor Rowland, assisted by Drs. Kimball and Perkins.

A photographic map of the spectrum has been nearly completed, and special preparations have been made for the exact measurement of wave lengths. These preparations have involved the construction of a comparator, a fine micrometer, and a spectrometer with telescopes having six and a quarter inch objectives and eight feet focal length.

The following researches have also been carried on during the year:

The investigation of displacement currents by electro-magnetic means.

The determination of the expansion of water between zero and forty degrees centigrade.

The preparation and study of standard cells.

The measurement of wave lengths of light in absolute measure.

During the month of October a course of twenty lectures on *Molecular Dynamics* was given by Sir William Thomson, D. C. L., F. R. S., &c., Professor of Physics in the University of Glasgow. These lectures were especially intended to develop the mechanics of the molecule in its relations to the luminiferous ether, and were attended by a number of professors and special students of physics from all parts of the country. Stenographic notes of the lectures were taken by Mr. A. S. Hathaway, and have since been written out and published.

Advanced students have taken part with the instructors in weekly meetings for the discussion of the current physical journals.

The following courses have also been carried on during the year:

Professor Rowland:

Lectures on Electricity and Magnetism. *Four times weekly, through the year.*

Dr. Kimball:

First year's course in General Physics. *Daily, through the year.*

Elementary Thermodynamics. *Weekly for eleven weeks.*

Theory of Electricity. *Twice weekly for ten weeks.*

Physical Optics. *Twice weekly for ten weeks.*

Dr. Perkins:

Laboratory work of the undergraduate students throughout the year.

CHEMISTRY.

Advanced students have been engaged daily in the laboratory in prosecuting such work as seemed best adapted to the purposes of each. Those who have completed the full courses in General Chemistry, including from two to three years' work in qualitative and quantitative analysis and about a year's work in making difficult and instructive preparations, were encouraged to undertake the solution of original problems.

The following investigations have been in progress during the year:

On chemical action in a magnetic field.

The effect of pressure on the transformation of a diazo-compound by boiling with alcohol.

The structure of benzoic sulphimide.

On para-brom-benzoic sulphimide.

On the relative stability of halogen derivatives of the paraffins in the presence of an alkali.

A method for the estimation of zinc dust.

An apparatus which enables students to determine the equivalents of certain metals.

An apparatus for distilling mercury in a vacuum.

The results of these investigations have either been already published or will soon appear in the *American Chemical Journal*. Some of them have been read before the Johns Hopkins Scientific Association at its regular meetings.

The Fellows and other advanced students have met the instructors twice a week during the year for the purpose of keeping abreast of the current

chemical literature. All the important journals have been carefully read, and full reports of the various articles have been made.

These students have been often called upon to treat important chemical questions in a broad way, going to the original sources and presenting the results in a complete form. In most cases the topics so investigated have been connected with the experimental work going on at the time; but other questions also have been elaborated in this way, which bore less directly on the current studies. In several cases carefully written reports of the results obtained have been prepared. The excellent library of chemical books and journals which is accessible to the students in the laboratory, at all reasonable hours, has greatly facilitated the execution of this very desirable literary work.

At the beginning of the year subjects were assigned to the Fellows and others for the preparation of lectures on various chemical topics treated historically; and sixteen such lectures were the result. These were prepared from a careful study of the original articles in the journals and were not borrowed from books on the history of chemistry. Full abstracts of these lectures, furnished with complete references to the articles consulted, are to be prepared and preserved in the chemical library. The lectures given were as follows:

- Two by Professor Remsen on The Basicity of Acids;
- One by Dr. J. R. Dugan on Disinfecting Agents;
- One by Mr. W. S. Bayley on The History of Uric Acid;
- Two by Dr. D. T. Day on Dissociation;
- One by Mr. C. S. Palmer on The Proust-Berthollet Controversy;
- Two by Dr. Morse on The History of Phosphorus;
- One by Mr. A. G. Palmer on Isomerism in the Benzene Series;
- One by Mr. H. W. Hillyer on Homology;
- Two by Dr. E. H. Kelsor on The History of Pyridine and Quinoline.

These lectures were attended by an average of twenty-five persons including the instructors.

In addition, the work of the year has consisted of the courses below mentioned:

Laboratory Work through the entire year, conducted by Professor Remsen, Dr. Morse and Dr. E. H. Kelsor.

Lectures by Professor Remsen:

- General Chemistry, *daily, first half-year.*
- Chemistry of the Compounds of Carbon, *daily, second half-year.*
- Chemical Philosophy, *twelve lectures, first half-year.*

Courses by Dr. Morse:

- Analytical Chemistry, *four times weekly, first half-year.*
- General Chemistry, *three times weekly, second half-year.*

MINERALOGY AND PETROGRAPHY.

Courses of lectures have been given by Dr. G. H. Williams on:

- Inorganic Geology, Petrography, and General Mineralogy. *Three times weekly.*
- Elementary Mineralogy, *twice weekly, second half-year.*

Daily laboratory instruction has also been given in microscopical petrography and physical mineralogy.

Frequent excursions have been made and considerable material for a geological map of the vicinity of Baltimore has been brought together; much information as to the number and range of the minerals occurring within this district has also been collected.

Special and detailed microscopic studies have been made of the basic massive rocks (hypersthene- and olivine-gabbros and peridotites) occurring near Baltimore, as well as of the molecular and chemical changes which these have undergone.

Considerable microscopic work has also been done on the interesting massive rocks occurring near Peekskill, N. Y., which have been called by Prof. J. D. Dana the "Cortlandt Series."

BIOLOGY.

The Biological Laboratory has been open for eight hours daily during the year, for the prosecution of advanced study and research and for courses of practical instruction in connection with class lectures.

During the year original investigations have been made in regard to the following subjects:

The proteids of blood plasma. The influence of intermittent pressure on arterial tonicity. The influence of various salts on arterial tonicity. The absolute relative value of commercial disinfectants and germicides. Regeneration of tissue in larvæ. The rate of propagation of the wave of muscular contraction. The proximate cause of the coagulation of blood. The functions of the cardiac nerves of the Chelonia. The nature of apnoea. The embryology of Echinoderms. The conditions which determine sex. The embryology of insects. The segmentation of the vertebrate skull. The homology of the hypoglossus nerve.

Preliminary notices of the results of most of the above researches have already been printed in the *University Circulars*, in the *Zoologischer Anzeiger* and elsewhere. Fuller accounts will shortly be published.

In connection with the regular class instruction, first year students studied a number of typical fungi, green plants, and animals; the skeletons of about twenty selected vertebrates; and the development of the chick in the egg. In the spring there were twelve practical lessons in the elements of Systematic and Descriptive Botany.

Second year students worked at the histology of the tissues and organs of the higher vertebrata (especially man); the physiological properties and functions of the tissues and organs; the physiology of digestion; the chemistry of bile, urine, etc. The cat and about twenty-five selected invertebrate and vertebrate types were thoroughly dissected by the second year students.

Dr. W. K. Brooks lectured twice weekly through the year on Advanced Morphology.

A course of seven lectures on Morphological Problems was given during April and May, as follows:

Three by Mr. E. A. Andrews on the Anatomy, Embryology, and Affinities of Annelids;
One by Dr. J. Playfair McMurrich on the Morphological Significance of the Hypoglossus Nerve;

One by Mr. A. T. Bruce on the Embryology of Insects;

One by Mr. Otto Lügger on Galls;

One by Dr. W. K. Brooks on Alternation of Generations.

A course of six lectures on Animal Teratology was given by Dr. W. T. Councilman during May.

Most of the advanced work was carried on individually, and not in class; each worker taking up some special topic for study under the immediate direction of some one of the instructors. In addition to the original researches already enumerated, certain graduate students have in this manner carried on advanced study in various directions.

Students engaged in this kind of study (which forms a stepping-stone between class-work and original research), are usually given some important original article, and shown how to repeat and verify for themselves (and

criticise) the experiments and results described in it. By studying and repeating the original work of others they learn the methods of biological investigation, and are thus trained to plan and carry out researches themselves. In connection with this work, students are also taught how to hunt up and utilize the bibliography of a subject.

Courses of lectures for undergraduates were given as follows:

Osteology, *twice weekly, until the end of March.*

Mammalian Anatomy, *twice weekly, until Christmas.*

Animal Physiology and Histology, *three times weekly, through the year.*

General Biology, *three times weekly, until the end of March.*

General Zoology, *from Christmas to end of the year.*

Embryology of the Chick and Mammal, *three times weekly, from the first of April until the close of the session.*

Plant Analysis, *twice weekly, in April and May.*

During the summer of 1885, the Chesapeake Zoölogical Laboratory for the study of forms of marine life was open at Beaufort, N. C., from May 23 to Sept. 15.

The advanced work included original investigations on the following subjects:

The embryology of *Limulus polyphemus*; the chemical composition and coagulation of the blood of *Limulus polyphemus*, *Callinectes hastatus*, and *Cucumaria* sp.; the presence of haemoglobin in the Echinoderms; the existence of a post-oral band of cilia in Gastropod Veligers; the rhythm and innervation of the heart of the Sea Turtle; the physiology of the heart of the Alligator; the cardiac rhythm of Fishes and the action on the same of certain drugs and poisons; origin of the endoderm in Lepidoptera; the artificial propagation and cultivation of Oysters in floats; the Stomatopoda.

GREEK.

Under the direction of Professor Gildersleeve the advanced students of Greek have been organized into a Greek Seminary. According to the plan of the seminary, the work of each year is concentrated on some leading author or some special department of literature. During the past year the work has been in the Attic Orators.

In the seminary proper, which met twice a week during the academic year, the orators chiefly studied were Antiphon, Andokides, Lysias, Isaios, and Demosthenes. Especial attention was paid to the development of language and style and to the antique canons of æsthetic criticism. The members were required to furnish in turn exegetical and critical commentaries on select portions of the orators, to make analyses of speeches and abstracts of rhetorical treatises.

Of the investigations carried on may be noted: The phraseology and syntax of the fifth oration of Antiphon, the style of Andokides' third as compared with the first and second orations, Thrasymachos of Kalchedon, comparative study of the Trapezitikos and Aiginetikos of Isokrates, synonymy in the orators, the use of the participle in Greek lyric poetry, on the language of the oracles especially in Herodotos, special studies in the vocabulary of Dionysios.

The work of the seminary was supplemented by the study, with critical exercises, under the guidance of the Director, of the rhetorical works of Dionysios of Halikarnassos, and by a course of lectures on the History of Greek Oratory.

Besides the seminary course proper, Professor Gildersleeve delivered twenty-three lectures on Greek Syntax, conducted twenty-two exercises in

translating at dictation from Greek into English and English into Greek, and gave a course of twenty lectures on Lyric Poetry. He also conducted a series of sixteen conferences in Greek Grammar for undergraduates.

Mr. Harris conducted class courses in New Testament Greek (three times weekly, first half-year, and five times weekly, second half-year), and in Sub-Apostolic Literature (three times weekly through the year); and gave a course of eight public lectures on the Perpetuation of Ancient Manuscripts.

Classes were conducted by Dr. Emerson in Classical Archæology (weekly through the year), in the Attic Judicial System (weekly, second half-year), and in the History of Ancient Art (twice weekly, second half-year).

Additional courses were conducted by:

Professor C. D. Morris, in

Plato, *Gorgias*, four times weekly, first half-year.

Aeschylus, *Persae*; Euripides, *Iphigenia in Tauris*, three times weekly, second half-year.

Reading at sight.

Dr. Spieker, in

Isocrates, I, IV; Xenophon, *Hiero*, four times weekly, first half-year.

Homer, *Iliad*, XVI-XVII; Euripides, *Hercules Furens*, four times weekly, second half-year.

Classes in Greek Prose Composition were also conducted by each of the instructors in connection with the courses above named.

Students have privately read for examination the following books:

Herodotus, *Merry's Selections*, (6).

Homer, *Odyssey*, XXI-XXIV, (6).

Xenophon, *Oeconomicus*, (7).

Plutarch, *Themistocles*, *Cicero*, (6).

LATIN.

The Latin Seminary, under the direction of Dr. Warren, held two sessions a week throughout the year, the authors forming the centre of work being the Roman Satirists, especially Horace and Juvenal.

Some of the Fragments of Lucilius were read and discussed, select Satires of Horace and Juvenal were interpreted by the members of the Seminary, in turn, and papers were read by them embodying the results of special studies. Among the subjects thus treated were Juvenal's use of the gerund and gerundive; words borrowed from the Greek used by Horace and Juvenal; the use of the conjunction *cum* in Juvenal; the conditional sentence in Juvenal; the *sermo familiaris* as seen in Lucilius, Horace, Persius, Juvenal, and Petronius; the use of certain suffixes in Plautus, Terence, Lucilius, Horace, Persius, and Juvenal; the future active participle in Juvenal; the position of adjectives with respect to their substantives in Horace; the so-called Sulpician Satira; the use of the preposition *de* in Juvenal; the differences existing between the Satires and other works of Horace; some peculiarities of the Horatian Hexameter based upon statistics collected by members of the Seminary.

In connection with the Seminary work, Dr. Warren gave a course of weekly lectures during the first half of the year on the Roman Satirists. In the latter half of the year Dr. Warren conducted a weekly course of Practical Exercises in Latin.

Additional courses have been conducted during the year by:

Dr. Warren, in

Plautus, *Mostellaria*, and Terence, *Andria*, three times weekly, first half-year.

Tacitus, *Agricola*, *Germania*, *Annals*, I, three times weekly, second half-year.

Reading at sight, weekly, throughout the year.

Professor C. D. Morris, in

Cicero, *de Oratore* 1, *Tusculan Disputations* 1, three times weekly, first half-year.

Catullus and Martial, *Select Poems*, three times weekly, second half-year.

Reading at sight, weekly, throughout the year.

Dr. Spieker, in

Livy, II, III, four times weekly, first half-year.

Horace, *Select Odes, Satires, and Epistles*, four times weekly, second half-year.

Classes in Latin Prose Composition, meeting weekly, were also conducted by each of the instructors in connection with the courses above named.

Students have privately read for examination the following books:

Cæsar, *Bellum Civile*, (9).

Cicero, *de Senectute*, (1); *de Amicitia*, (9); *Tusculan Disputations*, II, (2); *Orator*, (2).

Horace, *Epodes*, *Carmen Saeculare*, (12).

Livy, V, VI, (1).

Ovid, *Fusti*, I, II, (12); *Selections*, (1).

Plautus, *Capituli*, (3).

Pliny, *Select Letters*, (2).

Tacitus, *Agricola*, *Germania*, (1); *Histories*, I, (1); *Annals*, III, IV, (6), IV, V, (1).

Terence, *Phormio*, (3).

SHEMITIC LANGUAGES.

The work of the past year was essentially a continuation of the courses begun during the session 1883-84. For beginners the only course given was in elementary Hebrew. The course in the elements of Biblical Aramaean presupposed a thorough knowledge of Hebrew. The Shemitic studies again centred in the Old Testament on which at first five, and later four, lectures a week were given.

In the *Hebrew course for beginners* the essential elements of the grammar were acquired (after Gesenius-Kautzsch's Hebrew Grammar translated by E. C. Mitchell) and then the reading of the Pentateuch was entered upon.

In the *Hebrew Exercises* about forty chapters from the historical books of the Old Testament were read at sight: Exodus, 16; Genesis, 11 and 12; Jonah, 1 and 3; Job, 1 and 2; Exodus, 3 and 4; Judges, 19 and 20; 2 Samuel, 11; Numbers, 22; Judges, 11; 1 Kings, 17; Exodus, 31 and 32; 2 Kings, 19-21; Deuteronomy, 34, and Joshua, 1-2; Nehemiah, 1 and 2; Jeremiah, 37 and 38; 1 Samuel, 18; 1 Kings, 12 and 13; 1 Chronicles, 10, and 1 Samuel, 31, and 2 Samuel, 1; 2 Samuel, 12; Judges, 6; Ruth, 1 and 2; 1 Kings, 1 and 2; Nehemiah, 8 and 9.

In the (*Yitcal Interpretation of Selected Psalms*, Psalms, 23 and 1, and especially the fifteen post-exilic so-called Songs of degrees (Ps., 120-134) Hebrew *Shirê hamma'âlôth*, i. e., the Songs of the Return (from exile) were thoroughly explained and critically analyzed, with special attention to textual criticism, date of authorship, and constant comparison with the ancient versions of the Psalter.

In the course in the *Elements of Biblical Aramaean* the forms were studied after the paradigm-tables in Baer and Delitzsch's edition of *Libri Danielis, Ezechie et Nehemiae* (Leipzig, 1882) and the first chapters of the book of Daniel read. This course was especially intended as a preparation for the study of Syriac.

In *Arabic* there was read the anecdote of a man of Baghdâd and his slave girl from the *Kutûb lazẓîn el-asudq* (Kosegarten's *Chrestomathia Arabica*, p. 22; Petermann, *Brevia linguæ Arabicæ grammatica*, p. 33; cf. Lane, *The Thousand and One Nights*, Vol. III, p. 524), and then extracts from the *Travels of Ibn Batûtah* in the first volume of the *Beyrut Arabic Chrestomathy Majmû'at-el-adab* (Beyrut, 1883, Imprimerie Catholique); No. 302, The sheikh Abdallah and the elephants; No. 309, The wagons in the Crimean (*Qifjaq*) Steppes; No. 313, Ibn Batûtah's journey to the city of Bolgary; No. 314, Ermine and Sable; No. 320, Meteorites, and finally No. 314, Ibn Batûtah's journey to China and his suffering in captivity. In addition the class met two hours weekly to read easy Arabic

texts at sight, under the guidance of Dr. A. L. Frothingham, Fellow in Semitic Languages; selections from the Chronicles of Abulfaraj, fables, anecdotes, etc., were read.

In *Ethiopic* the whole book of Baruch in Dillmann's *Chrestomathia Aethiopica* was explained. This was preceded by a series of lectures on the grammar of the Gees language.

In *Assyrian* a course of lectures was first given on Comparative Assyrian Grammar, after which the cuneiform account of the campaign against the Arabians in the Annals of King Sardanapalus (B. C. 668-626) was studied. This was read and explained from beginning to end (V R. 7, 82-10, 5).

In *Sumero-Akkadian* the Syllabaries and Vocabularies in the first part of Haupt's *Kellschrifttexte* were finished, besides the Akkadian Incantation No. 9, and the Sumerian Penitential Psalms No. 14 in Haupt's *Texts*, and finally the Sumero-Akkadian Family Laws (V R., 24).

All the courses were one hour a week through the year with the exception of Elementary Hebrew, Ethiopic, and Assyrian, to which in turn two hours a week were devoted.

SANSKRIT AND COMPARATIVE GRAMMAR OF THE COGNATE LANGUAGES.

During the session the following courses were conducted by Dr. Bloomfield:

1. *Elementary Sanskrit*. The most essential elements of the grammar of the classical language were acquired in as short a time as possible, and then the students were brought face to face with the language, learning its structure and laws, not in the abstract, but in its living body. This course served especially, as was found by practical experience, to furnish the students with a knowledge of grammatical analysis, clearer and more exact than that which they bring with them from other philological pursuits. This is due partly to the unrivalled transparency of the structure of the language, and partly to the tradition which has kept alive a close bond between Sanskrit and Comparative and Historical Grammar. Five books of the *Nala* and about a dozen selections from the *Hitopadeśa* (both in Lanman's Reader), were read and thoroughly analyzed.

2. A second class in Sanskrit was conducted through a rapid course of reading in the *Hitopadeśa* and *Kuṭhāsārītāgara*.

3. The advanced class in *Vedic Sanskrit* began with a short course in the *Brāhmanas*, restricting themselves to the characteristic selections in Lanman's Reader, which were thoroughly analyzed. The greater part of the year was devoted to an introduction into the *sūtra*-literature, and the relation of the *sūtras* to the hymns of the *saṁhitās*. Selections from *Ācārāyana's gṛhyasūtras*, including the hymns cited in them, were read, and their bearing upon Indian life and literature in general was discussed. A series of selections from the law book of *Mānu* closed the work of the year.

4. A course in the *general principles of Comparative Philology* was carried on throughout the year. It was introduced by twelve lectures on the leading questions of Indo-European Comparative Grammar (*phonetic law and analogy, agglutination, the questions attaching themselves to the relationships of languages, etc.*). During the remainder of the year Professor Whitney's "Language and the Study of Language" was made the basis of instruction, but this was constantly supplemented by lectures, which aimed to advance the subjects treated in the book up to the present day.

5. A course in *Comparative Grammar of Greek*. This was devoted especially to a detailed exposition of the latest theories on *Indo-European vocalism*, and to a practical application of them to the body of the Greek language. Incidentally other important chapters of Greek Grammar, especially the *guttural series of consonants and questions on accentuation*, were treated. The most important phenomena in the vocalism of the principal related languages, Latin, Gothic, and Sanskrit, were also presented.

GERMAN.

Dr. Wood conducted the following advanced courses:

Gothic. *Twice weekly, first half-year*. The selections from Ulfilas in Braune's grammar were read and explained. A historical and critical introduction to the study was given, together with four lectures on the history of the Gothic declensions, and four on Gothic syntax.

Old High German. *Weekly, first half-year; twice weekly, second half-year.* The following parts of Braune's reader were read: Nos. 4, 5, 9, 16 (Tatian), 17 (the Strassburg Oaths), 28 (Hildebrandslied), 29, 30 (Muspilli), 31, 33, 34, 35, 38, 39, 40, 41, and part of 32 (Otfrid). Seven lectures were given on the High German Mutation of Consonants. Middle High German. *Weekly, through the year.* Paul's Grammar (second edition) was used. Selections (about half) from Walter von der Vogelweide (Wilmann's second edition), and one-third of Hartmann's *Iwein* (ed. Benecke-Lachmann) were read. Four lectures were given on Middle High German Metre. German Comparative Grammar. (Lectures). *Weekly, second half-year.*

The undergraduate courses were conducted by Dr. Wood and Mr. Hempl, as follows:

Major Course:

German Literature. Lectures. *Weekly.* DR. WOOD.
 Goethe: *Hermann and Dorothea; Faust I.* *Twice weekly.* MR. HEMPL.
 Selected Readings. Masius. *Lesebuch III.* *Weekly.* DR. WOOD.
 Prose Composition. *Weekly.* DR. WOOD.
 Exercises in German Style. *Monthly.* DR. WOOD.

Minor Course:

Lessing: *Minna von Barnhelm, Prosa.* Goethe, *Prosa.* (Two sections). *Twice weekly.* MR. HEMPL.
 Selected Readings. Oltrogge; *Lesebuch II.* (Two sections). *Twice weekly.* DR. WOOD and MR. HEMPL.
 Prose Composition. *Weekly.* MR. HEMPL.
 Oral Practice. *Weekly.* DR. WOOD.
 A class in German conversation was conducted by Dr. Gerber, daily, through the year.

Supplementary Classes:

First Section: Brandt's Grammar, Deutsch's Reader. Schiller: *Lied von der Glocke* (ed. Otis). *Three times weekly.* MR. HEMPL.
Second Section: Otis: Elementary German. Ludwig: *Schloss Heimburg.* *Five times fortnightly.* MR. HEMPL.

ENGLISH.

Advanced courses were conducted as follows:

Anglo-Saxon: *Béowulf.* *Weekly.* DR. WOOD. Seven lectures on Germanic Mythology were given with this course.
 Anglo-Saxon Grammar. Lectures. *Twice weekly, during March, April, and May.* DR. J. W. BRIGHT.

Additional classes, including the first and second year's courses for undergraduates were conducted as follows:

The minor (first year's) course was directed by Dr. Browne. The first half-year of this course was devoted to the Elizabethan writers. The work included a study of the period and its influences, the prose-writers, lyrists, and allegorical writers, and the rise and development of the drama. Shakespeare's *Julius Caesar* (Clark and Wright's edition) was carefully studied as class-work. The later Elizabethan drama was illustrated by Webster's *Duchess of Malfy*, and Fletcher's *Rule a Wife.* Abbott's *Shakespearean Grammar* was recommended for reference. The second half-year was employed in the study of fourteenth century literature. Texts studied in class were Chaucer, *Nonne Preestes Tale* (ed. Morris) and Langland, *Piers the Plowman*, Passus 1-3, 5-6 (Skeat's edition), and the period was further illustrated from Wyclif, the pseudo-Chaucer, and *Pierce the Ploughman's Crede.*

The major (second year's) course included instruction in Anglo-Saxon with Mr. C. B. Wright, twice weekly, through the year; Sievers' *Grammatik*, Sweet's *Reader*, and Cynewulf's *Elene* (ed. Zupitza) were used as text-books. Mr. A. E. Egge also conducted a class in Early English, twice weekly, through the year; Skeat's *Tale of Gamelyn*, and Morris's *Specimens of Early English, Part I*, were read.

The work in English done in the P. H. E. course (required of all undergraduates) was conducted by Dr. Browne and was directed with the view of giving the matriculates a sound general conception of the whole body of English literature from the earliest times down to the present century. No manual was used, the students being brought into contact with the original texts, except in the case of writers earlier than the fourteenth century, where the examples selected for illustration were modernized by the instructor. The class read aloud, under the instructor's guidance, Chaucer's *Prologus* and *Knights Tale* (Morris's edition), and Shakespeare's *Hamlet*. The ground covered by the course extended from *Beowulf* to Burke.

Courses of public lectures were given on:

English Poetry and the Poet Gray, by Mr. Edmund Gosse. (8).

Shakespeare, by Professor Hiram Corson. (20).

Phonetics, by Mr. A. Melville Bell. (7)

Shakespeare Bibliography, etc., by Mr. Justin Winsor. (2).

Shakespeare (Readings), by Mr. D. C. Bell. (2).

A Shakespeare Circle was formed under the general guidance of Dr. Browne and Dr. Wood, and held several conferences through the session.

ROMANCE LANGUAGES.

Advanced courses were conducted as follows:

The Romance Seminary, under the direction of Mr. Elliott. *Two hours a week through the year.*

The work was concentrated on three of the earliest Old French monuments, namely, the *Cantilène de Sainte Eulalie*, *Fragment de Valenciennes* and part of the *Passion du Christ*. The examination of these texts was on MS. fac-similes and bore upon both matter and form. In addition to it a Seminary meeting was held once a week in which all special students of this department took part.

Introduction to Old French Philology. *Aucassin et Nicolette* was critically studied with special reference to its phonology and morphology as compared with the Classic Latin, on the one hand, and with the Modern French on the other. *Weekly through the year.*

Wallachian:—The whole of Clonca's *Practische Grammatik der rumänischen Sprache* was worked through and short poetical extracts read from Alexandri, Alesandrescu, Muresianu and Sionu. *Weekly, second half-year.*

Lectures:—(a) On the Langue d'Oïl Dialects. The object of this course was to give the leading characteristics of the chief dialect groups that constitute the North French.

(b) The History of Romance Studies in Europe. *Weekly.*

(c) Comparative Romance Phonology. *Weekly.*

(d) Modern French Phonetics. *Weekly.*

(e) The History of the Past Participle in French. *Three Lectures.*

The undergraduate courses were as follows:

The students of the French Major Course read with Dr. Todd: In Bartsch's *Chrestomathie*, the selections from *Les plus anciens monuments*, *St. Alexis*, *Amis et Amiles*, *Bestiaire de Philippe de Thaün*, *Mystère d'Adam*, *Tristran*, *Roman de Rou*, *Contes del Graal*, *Sermon de Saint Bernard*, *Roman de Renart*, *Roman de la Rose*, *Villehardouin*, *Froissart*, *Philippe de Comines*, *Perceforest*; and the whole of the Oxford text of the *Chanson de Roland*.

Dr. Todd also gave, in this course, seven lectures on the French Literature of the Middle Ages.

The students of the French Minor Course read with Dr. Todd: *Le Voyage autour de ma Chambre* by Xavier de Maistre, *Les Jumeaux de l'Hôtel Corneille* by Edmond About, *Les Méaventures d'un Ecolier* by Töpffer, *Le Barbier de Séville* and the *Lettre critique sur le Barbier de Séville* by Beaumarchais, and *Hernani* by Victor Hugo. Twenty-minute talks on French Literature upon the basis of Saintsbury's *Primer* have been given in connection with the above readings; with Mr. Bowen they read 110 pp. of Montesquieu, *Grandeur et Décadence des Romains*, 75 pp. of Masson, *French*

Classics, Vol. VII., (Memoirs of 17th Century); 100 pp. of Milne-Edwards, *Précis d'Histoire Naturelle*, and in connection with this, studied 150 pp. of Breyman's *French Grammar*; with Mr. Fontaine they studied and prepared written exercises on the whole of Part I. and fifty *thèmes* of Part II. in Chardenal's Exercises for Advanced Pupils.

Mr. Fontaine met the students of the Minor Course five times weekly for French conversation with systematic instruction and drill in pronunciation.

Dr. Todd has conducted special courses in Italian, Spanish, Catalan, Old Provençal, Modern Provençal, and Portuguese:—The class in Italian have read the following authors. Goldoni: *Gl' Innamorati*; Manzoni: *I Promessi Sposi* (one hundred pages); Machiavelli: *Istorie Fiorentine* (second book); selections from Leopardi; and a short *Storia della Letteratura Italiana*. Exercises in grammar have been given twice weekly in connection with the above.

The class in Spanish read the following: Knapp's Spanish Readings (one hundred and fifty pages); *El Barómetro* (comedia); *Don Quijote* (ten chapters); and 1200 verses of the *Poema del Cid* (XII Century). Exercises in grammar were given twice weekly.

In Catalan the *Cronaca* of Ramon Muntaner, Chapters VI. to XXVII. (Cardona's *Dell' Antica Letteratura Catalana*), was read.

In Old Provençal were read the *Poème sur Boèce*; selections from *Girart de Rossilho*, from the poetry of Marcabrun, Bernart de Ventadorn, and Peire d'Alvernhe; and all the prose of Bartsch's *Chrestomathie*. In Modern Provençal, three cantos of Mistral's *Mirèio* were critically studied.

The class in Portuguese have read three cantos of Camoens's *Lusiads*, and numerous selections from Braga's *Antologia Portuguesa*, covering the most ancient period of the language.

Ten public lectures on Romance Literature were given in Hopkins Hall. Three of these by Dr. H. A. Todd, on *Contemporary Spanish Literature*, embraced: I, Contemporary Poetry in Spain; II, The Modern Spanish Novel; III, The Orators and Drama of Modern Spain. Seven lectures, by Associate Professor Elliott, on *Camoens*, covered: I, II, Sketch of Portuguese History to the Death of Camoens; III, Life of Camoens; IV, Minor Works of Camoens; V, VI, The *Lusiads*; VII, Camoens at Home and Abroad in the Nineteenth Century.

Two public courses on French Literature, including twenty-five lectures and readings (in French) were given by M. Rabillon.

HISTORY AND POLITICAL SCIENCE.

The Seminary of History and Politics, under the direction of Dr. H. B. Adams, has met once a week during the past academic year, each session occupying two hours. Attention has been confined to select topics of American Institutional and Economic History.

Dr. Adams conducted a class course for graduates in the History of Politics, three hours a week through the year.

The course consisted of (1) lectures by Dr. Adams, upon Greek, Roman, and Mediæval Theories of Politics, supplemented by student-reports on Modern Political Theories; (2) oral examinations upon Greek politics, historically considered; (3) lectures upon Modern European Politics, supplemented by the exposition of Bluntschli's *Lehre vom Modernen Staat*.

To undergraduates, Dr. Adams gave the following courses of instruction:

1. Fifteen introductory lectures on Ante-Classical History, with Keary's *Dawn of History* and Clodd's *Childhood of Religions* for text-books.
2. Two hours a week through the year on Church History in its relations to the Roman and German Empires, followed by lectures on the Italian Renaissance. The text-books employed were Plotz's *Epitome of Mediæval History* and Bryce's *Holy Roman Empire*, with required readings in Gibbon's *Decline and Fall of the Roman Empire*

and Milman's Latin Christianity. Two historical essays were required from each member of the class.

3. Two hours a week through the year on the History and Elements of International Law, a course consisting of lectures, the exposition of Bluntschli's *Moderne Völkerrecht der Civilisirten Staaten*, and reports by members of the class upon international topics. This course, with Dr. Jameson's three hours a week on the English and American Constitutions, constituted the second year in Politics.

Dr. R. T. Ely gave the following courses to graduate students:

1. Two lectures a week on Finance and Taxation. This course comprised an exposition of the general principles and history of money, banking, and finance, also the special subject of taxation in the Cities and States of the American Union, and a sketch of the financial history of the United States. Papers were prepared by members of the class, and class discussion was continually encouraged.
2. One lecture was given each week throughout the first half-year on the principles and historical growth of Commerce. It is hoped that this course will lead to original investigations in the History of American Commerce.
3. One lecture weekly was given throughout the second half-year on methods of Administration in England, Germany, and France. The special subjects treated were the organization of government, bureaucratic and self government, economic functions of government, sanitary legislation, poor laws, appointment and tenure of office, etc.

To undergraduate students, Dr. Ely gave a course of class instruction, five hours a week through the year.

This comprised the first year in the course on Political Science. The first term was devoted to the Elements of Political Economy; the second, to the History of Political Economy. Essays upon assigned topics were required from all members of the class.

Dr. J. F. Jameson conducted class courses as follows:

1. In Physical and Historical Geography (twenty exercises); in the History of Greece down to the time of the Roman conquest, and in the History of Rome and of the Roman Empire down to the fifth century A. D., two hours weekly through the year. The text-books employed were Tozer's Classical Geography, Fyffe's Greece, and Leighton's Rome.
2. In the History of France and England, employing as text-books the Student's History of France and Green's Short History of the English People. Three essays were required. This course, three hours weekly through the year, was in connection with Dr. Adams' class course of two hours a week on Church History, German Empire, and the Italian Renaissance.
3. In the second year's course in Politics, devoting three hours a week to the Constitutions of England and the United States, and using for that purpose two volumes in the English Citizen Series,—Walpole's Electorate and Legislature and Traill's Central Government,—also Bagehot's treatise on the English Constitution, and selections from the principal authorities upon the Constitutional Development of the United States.

PSYCHOLOGY, PEDAGOGICS, HISTORY OF PHILOSOPHY, ETC.

Professor G. Stanley Hall lectured twice weekly through the year on Psychology.

This course was in the main a continuation of the course begun the previous year, which was on the psycho-physics of the senses. The lectures began by describing the recent methods and results in the study of instinct. The topics of psycho-genesis, disorders of speech, illusions, the psychological aspects of insanity, localization studies in spinal cord and brain, psycho-physic time and the time sense, apperception and will, and psychological anthropology, were treated with charts, illustrations and literature.

Four students were engaged in original psycho-physic research, the results of which will be made public in due time.

Two weekly conferences were held by Professor Hall during the last half-year, one devoted to ethics, and the other to scientific topics in psychology.

Professor Hall lectured once weekly through the year on Education. Student life and societies and customs in the middle ages introduced the history of the Italian, French, English and German universities, their organization and legislation, courses of study, &c. Then followed a sketch of the development of primary and secondary State and private schools, their organization, relation to the State, courses of study, with a detailed account of the work in a typical gymnasium, real-school, and French and English schools of a similar grade. The educational ideas of Comenius, Sturm, Locke, Montaigne, Herder, Pestalozzi, Rousseau, Kant, Niemeyer, Schwartz, Graser, Schleiermacher, Herbart, Waitz, Beneke, and contemporary writers were epitomized. The development of modern methods in a few cardinal branches of common school study was given with many illustrations. The history of English and Prussian school legislation was outlined, and the unfoldment and present condition of industrial education in the different countries was sketched. Classical, female, professional education, were treated historically, and the course concluded with an account of the institution and philosophical ideals of education in ancient Greece.

A course of twelve lectures on educational topics was given on Saturday mornings to a company of about one hundred graduate students. Lectures were given by President Gilman, and by these members of the academic faculty: Messrs. Hall, Newcomb, Bloomfield, Brooks, Craig, Elliott, Ely, Harris, Hartwell, Story, and Warren.

A few lectures were given by Professor Hall on Mental Hygiene to the undergraduate students.

Professor G. S. Morris gave the following courses:

History of Philosophy in Greece. *Twice weekly, first half-year.*

Topics involved:—The beginnings of science. Anticipations of the modern doctrine of development. Establishment of elementary conceptions of physical science. First application of mathematical conceptions to the comprehension of the universe. Beginnings of abstract speculation. First successful development of concrete or substantial idealism, including science of method (logic), and philosophy of nature, man, the State, art, and education. Systems of practical philosophy.

Ethics, or the Science of Man. *Two lectures weekly, first half-year.*

A consideration of the foundations and content of ethical science, together with an historical survey.

E.

Report of the Chesapeake Zoölogical
Laboratory.

SESSION OF 1885.

To the President of the Johns Hopkins University:

SIR: In accordance with your request, I have the honor to submit to you the following report of the eighth session of the marine laboratory of the University.

The laboratory was opened at Beaufort, N. C., on May 23, and it was occupied for research until September 15, or a little more than sixteen weeks. Its facilities were used by twelve investigators, and as the house which we have occupied for several years at Beaufort is too small to accommodate so large a party, I should have been forced to refuse to receive some of them if it had not fortunately happened that the only large house near the laboratory and suitable for our use was vacant this summer. I, therefore, rented it, with its furniture, for the use of our party, and as it furnished lodgings for several of us, and also enabled me to devote to scientific purposes the rooms in the laboratory which we have used in previous seasons as a kitchen and dining room, I found the necessary space for our party of twelve, although I was compelled to refuse three other applicants for lack of room.

The following is a list of the members of our party.

- W. K. Brooks, Ph. D., *Associate Professor of Morphology, J. H. U.—Director.*
- E. A. Andrews, Ph. B., *Fellow, J. H. U.*
- A. T. Bruce, A. B., *Fellow by Courtesy, J. H. U.*
- G. B. Haldeman, A. B., *Graduate Student, J. H. U.*
- J. C. Hemmeter, M. D., *Graduate Student, J. H. U.*
- F. H. Herrick, A. B., *Graduate Student, J. H. U.*
- W. H. Howell, Ph. D., *Associate, J. H. U.*
- O. P. Jenkins, A. B., *Terre Haute, Ind.*
- T. W. Mills, M. D., *Lecturer on Physiology, McGill University, Montreal.*
- J. P. McMurrich, Ph. D., *Instructor, J. H. U.*
- A. D. Morrell, *Chapel Hill, O.*
- H. F. Nachtrieb, S. B., *Assistant Professor of Biology, University of Minnesota.*

I have been able this season to make important additions to a monograph on the Medusæ of Beaufort, which has occupied me for the past five years, and which is now complete. Dr. McMurrich began this season the preparation of a similar monograph on the Anthozoa of Beaufort; and Mr. Andrews, who has been occupied for two years in the preparation of a similar history of the Annelids of Beaufort, has made numerous important

additions to his notes, and he has also obtained much valuable material for the study of the embryology of Annelids, upon which he is now at work in Baltimore. Professor Nachtrieb, who has been engaged for several years in a similar monographic study of the Echinoderms of Beaufort, continued this work during the season.

Two monographs on the fauna of Beaufort, one by Professor Conn, on the Crabs of Beaufort, and my own on Beaufort Medusae are now complete and ready for publication.

The members of our party also carried on researches on the embryology of the crustacea, the metamorphosis of macroura, the development of gasteropods, the propagation of the oyster, and many other subjects; and abstracts, giving an outline of the results of researches on the following topics, were published in the University Circular for October, 1885:—

The Metamorphosis of *Limulus polyphemus*, by Prof. H. L. Osborn, Purdue University, Indiana; Abstract of Researches on the Embryology of *Limulus polyphemus*, by W. K. Brooks and A. T. Bruce; Observations upon the Chemical Composition and Coagulation of the Blood of *Limulus polyphemus*, *Callinectes hastatus*, and *Cucumaria*, by W. H. Howell; On the presence of Haemoglobin in the Echinoderms, by W. H. Howell; On the Existence of a Post-Oral Band of Cilia in Gasteropod Veligers, by J. Playfair McMurrich; The Rhythm and Innervation of the Heart of the Sea Turtle, by T. Wesley Mills, Lecturer on Physiology, McGill University, Canada; On the Physiology of the Heart of the Alligator, by T. Wesley Mills; The Cardiac Rhythm of Fishes and the Action on the same of certain Drugs and Poisons, by T. Wesley Mills; On the Artificial Propagation and Cultivation of Oysters in Floats, by W. K. Brooks; Notes on the Stomatopoda, by W. K. Brooks; Notes on the Fishes of Beaufort Harbor, N. C., by O. P. Jenkins.

One of the most important and interesting of our studies is the work which has been carried on for several seasons on the natural history of *Limulus*. In 1884, Mr. Osborn discovered that the eggs of *Limulus* can be fertilized artificially, and that there is no difficulty in thus obtaining an abundant supply of the early stages. From the eggs which were thus fertilized Mr. Osborn reared a number of larvae, from which he made a series of valuable drawings of the external features. This summer Mr. Bruce and I have continued the study and have obtained a very complete history of the development of *Limulus*, an abstract of which appeared in the University Circular, No. 43, October, 1885. The most interesting result of this study is the evidence which it furnishes to show that the embryonic history of *Limulus* exhibits the most striking similarity to that of the ordinary Arachnida. A week after the publication of this abstract our library received the current number of the Quarterly Journal of Microscopical Science, in which there is an illustrated paper on the embryology of *Limulus*, by Mr. Kingsley, of Salem, Mass., who has reached a similar conclusion. Dr. Howell devoted a part of the season to the study of the blood of *Limulus*, Mr. Jenkins studied the histology of its digestive tract, and Mr. Wilson its nervous system, and the results of their investigations are either ready for publication or well advanced.

Within the last two months, the second of Mr. Wm. Bateson's papers on *Balanoglossus*, giving the results of his researches at Beaufort in 1884, has been published in the *Quarterly Journal of Microscopical Science*, and it is of especial interest, as he gives many very convincing reasons for believing that *Balanoglossus*, a very lowly organized and simple worm-like organism, is a vertebrate, and by far the most primitive member of this group.

I was occupied for the whole of last winter in preparing from my notes, made at the marine laboratory, an illustrated paper on the origin of alternation of generations in the *Hydro-Medusae*. This paper, with eight quarto plates, is now in press, and it will soon appear in the *Memoirs of the Boston Society of Natural History*. Several minor papers on various subjects are also now ready for publication, and some of them are to appear in the next number of the *Studies from the Biological Laboratory*.

Through the combined efforts of several of the members of our party, a paper giving a list of the animals which occur at Beaufort, with short notes as to their localities, habits, spawning season, development, etc., is now in preparation, and it is to be published this winter in the "*Studies*."

I was able during the past season to make a few observations upon the *Stomatopoda* which occur at Beaufort, and they are embodied in my report on the *Stomatopoda* collected by the *Challenger Expedition*, which will be ready for the press in a few days. It is to form part of the series of illustrated quarto volumes on the "*Scientific Results of the Challenger Expedition*," now in course of publication by the British Government.

Respectfully,

W. K. BROOKS,
Director, Marine Laboratory.

BALTIMORE, *November, 1885.*

F.

Proceedings of University Societies.

The several scientific associations, composed of members of the faculty and advanced students, have met for the presentation and discussion of original papers as below stated.

1. The Scientific Association, under the presidency of Professor Martin, has had seven meetings. Papers have been read by:—

W. K. Brooks, on a new theory of variation; methods for producing illustrations for scientific papers.

H. Crew, an account of Juincke's experiments on hydrostatic pressure in a magnetic field.

H. H. Donaldson, the change of color in *Anolis*; the temperature sense.

J. R. Duggan, the relation of antiseptic power to chemical constitution.

G. S. Hall, on recent experiments on the sense of rhythm; on the question, is scientific psychic research practicable?

C. W. Hayes, on new forms of laboratory apparatus.

J. Jastrow, a comparison of sight and touch.

H. N. Martin, on a certain visual phenomenon not hitherto described.

P. Morrill, on methods of measuring atmospheric electricity.

H. N. Morse, on a simple apparatus that enables students to determine the equivalents of some of the elements.

J. P. McMurrich, the theory of the vertebrate skull.

S. Newcomb, the possibility of applying mathematics to political economy.

C. A. Perkins, on the seat of electromotive force in the voltaic cell.

I. Remsen, on the measure of the attractive force exerted by isomeric and homologous molecules; on the recent discovery of thiophene.

H. A. Rowland, on Sir William Thomson's models to illustrate the theory of light.

G. M. Sternberg, on the question, why does one attack of many infectious diseases protect from a second?

W. E. Story, an account of some geometrical models recently purchased.

G. H. Williams, on the results of the most recent work on the metamorphic and crystalline rocks.

2. The Philological Association, under the presidency of Professor Gildersleeve has had eight meetings. Papers have been read by:—

C. Adler, on the etymology of elixir; note on the catalogue of the books of the Bible in the MS. of the "Teaching of the Twelve Apostles."

W. M. Arnolt, on some oracles in Herodotus.

M. Bloomfield, two etymological notes; the probable Sanskrit equivalent of the Greek particle *ἐπ, πα*; on a new group of Vedic words, belonging to the root *prag*.

J. W. Bright, an account of King Alfred's Anglo-Saxon version of the *de consolatione philosophiae* of Boethius.

A. M. Elliott, on a philological expedition to Canada.

A. Emerson, Petrarca's relations to the universities of his time.

A. L. Frothingham, the meaning of Baalim and Ashtaroth in the Old Testament.

W. E. Gates, some notes on the Elene and Cynewulf.

B. L. Gildersleeve, on Well's view of the origin of the word "poet;" the final sentence in classic Greek prose.

J. R. Harris, the western readings of the New Testament; the Codex Martinianus of the New Testament.

P. Haupt, on a Eucharistic sermon by John Chrysostom preserved in Ethiopic.

A. H. Huizinga, the lessons of the Peloponnesian War as developed in the speeches of Thucydides.

M. D. Learned, the English element in Pennsylvania German.

C. D. Morris, some account of Belock's speculation on the financial history of Athens.

E. M. Pease, the relative value of the MSS. of Terence, collated by Umpfenbach.

E. H. Spieker, the dialects of North Germany.

M. Warren, the etymology of hybrid; some old glosses in Codex Sangallensis 912.

H. Wood, the persistence of alliteration in English.

3. The Mathematical Society, under the presidency of Professor Newcomb, has had three meetings. Papers have been read by:—

F. Cajöri, on a quadratic form.

F. Franklin, the discriminant of the equation which determines the axes of a quadratic surface.

A. S. Hathaway, the division of irrational algebraic quantity by real primes.

J. F. McCulloch, on the theorem, "every equation has a root."

W. E. Story, on generalized quantity; on the development of rational fraction in partial fractions.

C. Veneziani, on the extension of Rolle's theorem to non-uniform algebraic functions; on the geodesic line.

4. The Historical and Political Science Association, under the direction of Dr. H. B. Adams, has held frequent meetings. Among the papers read were the following:—

H. B. Adams, on the American historical association; the progress of civil service reform in the United States; principles of graduate and undergraduate work in history and politics; the historical trips at the University of Cambridge.

- F. A. Bancroft, on the negro in Mississippi politics.
- L. Bonsal, on the question, what became of the northern slaves?
- J. R. Brackett, on the slaveholders' convention at Annapolis in 1841; on the free negroes in Maryland.
- J. Bryce, on the doctrine of *laissez-faire* (letter).
- D. R. Dewey, on Jevon's investigations in currency and finance; on American literature relating to money, credit, and banking (chapters from a "History of Economic Thought in America").
- R. T. Ely, on Pullman, a social study; on contemporary socialism; on the B. O. relief association; introduction to the study of administration.
- E. A. Freeman, on the study of history at Oxford (letter).
- E. R. L. Gould, on the House of Lords; on Canadian studies in local history.
- F. H. Hodder, on the city government of Chicago.
- W. P. Holcomb, on Pennsylvania boroughs.
- E. J. James, on the study of political science in American colleges.
- J. F. Jameson, on the study of the constitutional and political history of the individual states; on the state constitutions of the revolutionary period; on the reception of the Massachusetts constitution of 1780 by the towns.
- C. H. Levermore, on the history of witchcraft in Connecticut; on the colony at Saybrook, Connecticut; on judicial procedure in the early New Haven courts.
- D. R. Randall, on the puritan colony at Annapolis.
- J. C. Rose, on the city government of Baltimore.
- D. W. Rose, on the methods of studying history in the college and in the university.
- S. Sato, on the land laws of the United States.
- W. B. Scaife, on boundary disputes between Pennsylvania and Maryland.
- E. Schuyler, on the foreign relations of the United States.
- A. Scott, on the New Jersey proprietors.
- A. Shaw, on the Northwest as a field for original studies.
- C. H. Shinn, on the land laws of mining districts.
- W. Wilson, on the House of Representatives, revenue and supply (chapter from "Congressional Government"); on recent American economists (chapters from a "History of Economic Thought in America").
- T. K. Worthington, on Pennsylvania state finance and taxation; village communities on the Delaware.

5. The Metaphysical Club, under the direction of Professor Hall, has had four meetings. Communications were presented by:—

- A. T. Bruce, on final causes.
- H. H. Donaldson, on visual localization and the sensation of heat; on the newly discovered organs of the heat sense.
- A. H. Gross, on the psychology of reading; on the introspective method.
- G. S. Hall, reviews of Meynert's *Psychiatrie*, Radestock's *Genie u. Wahnsinn*, and Sully's *Psychology*; reviews of recent psychophysics studies.
- J. Jastrow, on a series of books on ultra-longevity; demonstration of logical machines.
- C. H. Levermore, an educational study; the boy in education.
- G. S. Morris, on Kapp's *Grundriss einer Philosophie der Technik* and on Du Prel's *Philosophie der Mystik*; on the method of philosophy.
- J. C. C. Newton, on a case of contagious frenzy.
- W. Noyes, Jr., on local facilities for the study of mental diseases.
- C. S. Pierce, on *The Magnet*, a fourteenth century manuscript of Petrus Peregrinus.
- G. E. de Steiguer, on a case of visualized number forms.
- M. I. Swift, on final causes.

6. The Archaeological Society, of which Dr. A. L. Frothingham, Jr. is secretary, has held several meetings. Among the papers presented were the following:—

- M. Cohen, on Col. M. I. Cohen, and his collection of Egyptian antiquities, lately acquired by the University.

A. Emerson, on Greek and Etruscan vases.

C. C. Hall, on the Great Seal of Maryland.

A. M. Wilcox on the American school of archaeology at Athens.

During the past session, there has been a series of loan exhibitions, under the direction of the Archaeological Society, of works of art generously contributed by Mr. A. L. Frothingham, as follows:

November 22, 29, December 6.—Original drawings by old masters of the Italian schools, XVI to XVIII centuries.

December 13, 20.—Photographs of Italian sculpture and painting of the XV century.

January 10, 17.—Photographs of Italian sculpture and painting of the XIV and XVI centuries.

January 24, 31.—Engravings of Italian, French, German and British schools of the XVIII and XIX centuries.

February 7, 14.—Line engravings of portraits of all schools from the XVI to the XIX century (Italian, French, German, Flemish, Dutch and British.)

February 21, 28.—Etchings of Italian schools from the XVI to the XIX century.

March 7, 14.—Etchings of Dutch, German, Flemish and French schools.

March 28, April 4.—Line engravings of Italian schools from the XV to the XVIII century.

April 11, 18, 25.—Line engravings of German, Dutch, Flemish, French and British schools from the XVI to the XVIII century.

May 2, 9, 16.—Original drawings by old masters of the Italian, French and Dutch schools.

The permanent exhibition consisted of fragments of antique sculpture, Etruscan and Italo-Greek vases, and Egyptian statuettes from the Cohen Collection.

7. The Baltimore Naturalists' Field Club, under the presidency of Dr. G. H. Williams, has held seven meetings during the past year. At these meetings, reports were given by various members upon observations made in some of the three departments of the club devoted respectively to Geology and Mineralogy, Zoology, and Botany. Abstracts of these papers and of other more informal communications may be found in the University Circulars, Nos. 35, 38, and 41.

G.

List of Correspondents.

During the past year the Publication Agency of the Johns Hopkins University has received, in exchange with the journals here published, the scientific and literary publications of the institutions named below. A full list of the periodicals on file in the University library (including the journals, etc., received in exchange) is given in University Circular, No. 42, September, 1885.

GERMANY AND AUSTRIA.

Berlin: Deutsche chemische gesellschaft.

K. Preuss. akademie der wissenschaften.

Cassel: Verein für naturkunde.

Cracow: Académie des sciences.

Dresden: Naturwissenschaftliche gesellschaft Isis.

Erlangen: Seminarium philologicum.

Frankfort a. M.: Senckenbergische naturforschende gesellschaft.

Frankfurt a. O.: Naturwissenschaftliche verein.
 Freiburg i. B.: Naturforschende gesellschaft.
 Göttingen: K. gesellschaft der wissenschaften.
 Hamburg: Naturhistorisches museum.
 Mathematische gesellschaft.
 Wissenschaftliche anstalten.
 Hannover: Historische verein für niedersachsen.
 Heidelberg: Naturhistor-medizinische verein.
 University.
 Hermannstadt: Verein für naturwissenschaften.
 Innsbruck: Institut für Oesterreich. geschichtsforschung.
 Kiel: University.
 Observatory.
 Leipzig: Astronomische gesellschaft.
 K. Sächsische gesellschaft der wissenschaften.
 Mainz: Mittel-rheinische fabrikanten-verein.
 Munich: K. Bayerische akademie der wissenschaften.
 Gesellschaft für anthropologie, etc.
 Görres-gesellschaft.
 Prague: K. Böhmisches gesellschaft der wissenschaften.
 Verein für geschichte der Deutschen in Böhmen.
 Stuttgart: Verein für vaterländisch-naturkunde.
 Trieste: Museo civico di storia naturale.
 Vienna: Gesellschaft für bildende künste.
 K. k. akademie der wissenschaften.
 K. k. geologische reichsanstalt.
 K.-k. Oest. museum für kunst und industrie.
 Ornithologische verein.
 Zool. inst. der universität.
 Wiesbaden: Nassauische verein für naturkunde.
 Würzburg: Medicinische facultät.
 Zool. zootomische institut.

FRANCE AND SWITZERLAND.

Avranches: Société d'archéologie.
 Berne: Schweiz. gesellsch. für d. gesammten wissenschaften.
 Caen: Académie des sciences, arts et belles-lettres.
 Société des pharmaciens du Calvados.
 Cherbourg: Société nationale des sciences nat. et math.
 Paris: Institut de France: académie des sciences.
 Association française pour l'avancement des sciences.
 Assoc. pour l'encouragement des études grecques.
 Bureau des longitudes.
 École centrale des arts et manufactures.
 École des chartes.
 École normale supérieure.
 École polytechnique.
 Faculté des sciences à la Sorbonne.
 Ligue française de l'enseignement.
 Ministère de l'instruction publique.
 Observatoire.
 Société chimique.
 Société de l'enseignement supérieur.
 Société de l'histoire du protestantisme français.
 Société de législation comparée.
 Société française d'archéologie.
 Société historique et cercle St. Simon.
 Société mathématique de France.
 Société nationale d'antiquaires de France.

Roscoff: Laboratoire d. zoologie expérimentale.
 Toulouse: Académie des sciences.
 Zurich: Société helvétique des sciences naturelles.

BELGIUM AND HOLLAND.

Amsterdam: Royal academy of sciences.
 Royal zoological society.
 Brussels: R. académie des sciences de Belgique.
 Musée royal d'histoire naturelle.
 Société royale malacologique de Belgique.
 Observatoire royal.
 Delft: École polytechnique.
 Harlem: Musée Teyler.
 Société Hollandaise des sciences.
 Leyden: Nederland. dierkundige veren.
 Liège: Société royale des sciences.

ITALY.

Bologna: R. deputazione di storia patria.
 Società medica-chirurgica.
 Brescia: Ateneo di Brescia.
 Como: Società storica per la provincia di Como.
 Florence: Società entomologica italiana.
 Genoa: Società di lettura.
 Milan: Istituto Lombardo di scienze e lettere.
 R. accademia di belle arti.
 Naples: R. accademia delle scienze fisiche e matematiche.
 Società di storia patria.
 Zoological station.
 Padua: Società Veneto-trentina di scienze naturali.
 Palermo: Circolo matematico.
 Società Siciliana per la storia patria.
 Rome: Commissione archeologica comunale.
 R. accademia dei Lincei.
 R. comitato geologico d'Italia.
 Department of foreign affairs.
 Società geografica italiana.
 Società Romana di storia patria.
 Turin: Osservatorio della università.
 R. accademia delle scienze.
 Venice: R. Istituto Veneto.
 R. deputazione Veneto s. g. s. di storia patria.

SPAIN AND PORTUGAL.

Barcelona: Associació d'excursions Catalana.
 Lisbon: Academia real das sciencias.
 Sociedade da geografia.
 Madrid: R. academia de la historia.
 Observatorio astronomico.
 San Fernando: Instituto y observatorio de marina.

DENMARK, SWEDEN AND NORWAY.

Bergen: Museum.
 Christiania: University.
 Commission der gradmessung.
 Société des sciences.
 Copenhagen: Royal academy of sciences.

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Stockholm: Högskola.
Geologiska forening.
Physiologische laboratorium.
K. Svenska vetenskaps akademie.
K. historiske antiquitets akademie.

RUSSIA AND FINLAND.

Charkow: Mathematical society.
Dorpat: Naturforscher gesellschaft.
Helsingfors: Societa scientiarum fennica.
Moscow: Société impériale des naturalistes.
St. Petersburg: Académie impériale des sciences.
Russian archæological society.
Russian chemical society.

GREAT BRITAIN AND IRELAND.

Birmingham: Philosophical society.
Cambridge: Antiquarian society.
Philological society.
Philosophical society.
Dublin: Royal Dublin society.
Royal Irish academy.
University press.
Edinburgh: Royal physical society.
Royal society.
Glasgow: Philosophical society.
Observatory of the university.
Greenwich: Royal observatory.
London: Chemical society.
Conchological society.
Crystallogical society.
Geological society.
Institute of actuaries.
Mathematical society.
Mineralogical society of Great Britain and Ireland.
Palestine exploration fund.
Philological society.
Royal astronomical society.
Royal institution.
Royal microscopical society.
Royal society.
Science and art department (South Kensington).
Society of biblical archæology.
Society of chemical industry.
Society of telegraph engineers.
Statistical society.
Manchester: Literary and philosophical society.
Oxford: Historical society.

BRITISH EAST INDIAN POSSESSIONS.

Calcutta: Asiatic society of Bengal.
Colombo, Ceylon: Ceylon branch of royal Asiatic society.
Singapore: Straits branch of the royal Asiatic society.

AFRICA.

Bone, Algeria: Académie d'Hippone.
Oran, Algeria: Société de géographie et d'archéologie.

JAPAN.

Tokio: Seismological society of Japan.
 University: science department.
 Yokohama: Asiatic society of Japan.

AUSTRALIA AND NEW ZEALAND.

Adelaide: Royal society of South Australia.
 Sydney: Linnean society.
 Royal society of New South Wales.
 Wellington: New Zealand institute.
 Colonial museum.
 Geological survey.

MEXICO AND SOUTH AMERICA.

Cordoba (Arg. Rep.): Academia nacional de ciencias.
 Mexico: Observatorio del México.
 Quito: Universidad de Quito.
 Rio de Janeiro: Observatoire impériale.

DOMINION OF CANADA.

Halifax: Institute of natural science.
 Montreal: Royal society of Canada.
 Natural history society.
 Ottawa: Geological and natural history survey.
 Toronto: Canadian institute.

GREECE AND TURKEY.

Athens: Deutsch. archäolog. institut.
 Constantinople: Hellenikos philologikos syllogos.

UNITED STATES.

American association for the advancement of science.
 American historical association.
 American institute of mining engineers.
 American medical association.
 American oriental society.
 American philological association.
 American social science association.
 Association of engineering societies.
 Albany: N. Y. state museum of natural history.
 Annapolis: U. S. naval institute.
 Baltimore: Maryland historical society.
 Medical and chirurgical faculty of Md.
 Peabody Institute.
 Boston: American academy of arts and sciences.
 Mass. historical society.
 National association of wool manufacturers.
 New England historic-genealogical society.
 Public library.
 Society of natural history.
 Webster historical society.
 Zoological society.
 Cambridge, (Mass.): Harvard college observatory.
 Harvard college library.
 Museum of comparative zoölogy.
 Chicago: Academy of sciences.

- Cincinnati: Mechanics' institute.
Observatory.
Public library.
Society of natural history.
- Concord: New Hampshire historical society.
- Davenport (Iowa): Academy of natural sciences.
- Denver: Colorado museum of geology, etc.
Scientific society.
- Normal (Ill.): Illinois state laboratory of natural history.
- Iowa City: Iowa state historical society.
- Ithaca (N. Y.): Cornell university library.
- Lincoln (Neb.): Nebraska historical society.
- Lowell (Mass.): Historical association.
- Madison (Wis.): Washburn observatory.
Wisconsin historical society.
- Minneapolis: Minnesota academy of natural sciences.
Minnesota natural history and geological survey.
- New Haven: Connecticut academy of arts and sciences.
- Newark: New Jersey historical society.
- Newport (R. I.): Natural history society.
- New York: Academy of sciences.
American chemical society.
American geographical society.
American institute of mining engineers.
American museum of natural history.
Columbia college, school of mines.
Linnaean society.
Microscopical society.
Military service institution.
- Philadelphia: Academy of natural sciences.
American philosophical society.
College of physicians.
Franklin institute.
Library company.
Mercantile library.
Penna. historical society.
University of Pa., Wharton school.
- Portland: Maine historical society.
- Princeton (N. J.): Museum of geology and archaeology.
- Providence: Rhode Island historical society.
Public library.
- Raleigh: North Carolina agricultural experiment station.
- Richmond: Southern historical society.
Virginia historical society.
- Salem (Mass.): Essex institute.
Peabody academy of sciences.
- San Francisco: California academy of sciences.
Technical society of the Pacific Coast.
- Savannah: Georgia historical society.
- Sedalia (Mo.): Natural history society.
- St. Louis: Academy of sciences.
- St. Paul: Minnesota historical society.
- Topeka: Kansas state historical society.
Washburn college laboratory.
- Troy (N. Y.): Rensselaer society of engineers.
- Washington: Army medical museum.
Astronomical observatory.
Biological society.

Washington: Bureau of ethnology.
 Coast and geodetic survey.
 Corps of engineers.
 Fish commission.
 Geological survey.
 Naval museum of hygiene.
 National academy of sciences.
 National museum.
 Naval medical society.
 Patent office.
 Philosophical society.
 Signal service.
 Smithsonian institution.
 Other government publications.
 Worcester: American antiquarian society.

II.

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 BRITISH MUSEUM. Collectio Davidia. Hamburg, 1826. D.
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Virginia School Reports. Richmond, 1871-83. 9 vols. O.
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